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The Odorless Sewer Basin Does Away With All Nuisance

and Saves Money in Cost of Cleaning

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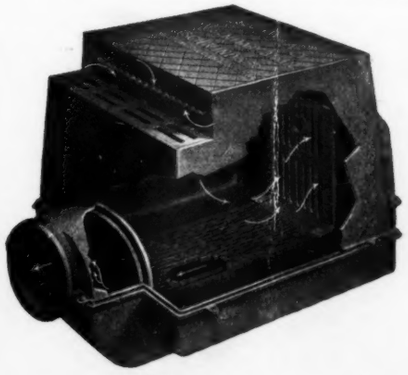
ECONOMY IN COST OF CLEANING

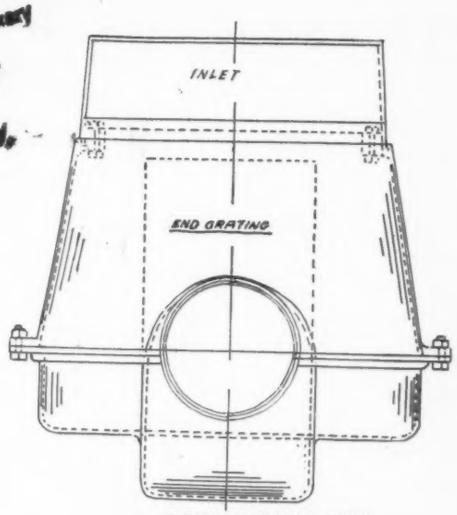
One man with a long handle shovel and a cart can clean as many Odorless Sewer Basins in a day as two men can clean of the old style basins in five days.

Write for a list of cities where the odorless Sewer Basin has been installed and literature describing it in detail.

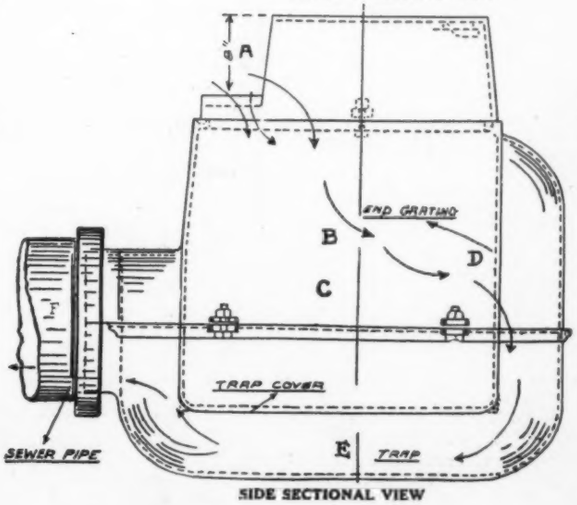
The Odorless Sewer Basin Co.

15 Wick Ave., Youngstown, O.





FRONT SECTIONAL VIEW



SIDE SECTIONAL VIEW

TABLE OF CONTENTS, PAGE 3

INDEX TO ADVERTISEMENTS, PAGE 46

Cast Iron Pipe lasts too long in Montreal

As Montreal's Superintendent of Water Works puts it:

"Cast Iron Pipe in any water works system in a growing community should long outlast its usefulness, that is, the growth of the community would probably make the pipes too small 40 or 50 years after they were laid."

"That condition, we figure, is the greatest cause of depreciation in value of the water main. Cast Iron Pipe itself in ordinary soils is well nigh 'everlasting.'"

Count that attitude as the reason why over 500 miles of Cast Iron Water and Gas Pipe have been laid in Montreal during the past sixty years.

And there is a lesson here, too—make a liberal allowance for the growth of your city and install Cast Iron Pipe of ample capacity.

THE FIRST CAST IRON PIPE EVER MADE IN THE WORLD'S HISTORY IS STILL IN SERVICE
SERVICE
CAST IRON PIPE
MEASURED BY
CAST IRON PIPE
CENTURIES
MORE THAN 250 YEARS OLD

The Cast Iron Pipe Publicity Bureau

1 Broadway, New York

Municipal Journal

Volume XLIII NEW YORK, AUGUST 2, 1917 No. 5

CONSTRUCTION WORK ON DU PONT ROAD

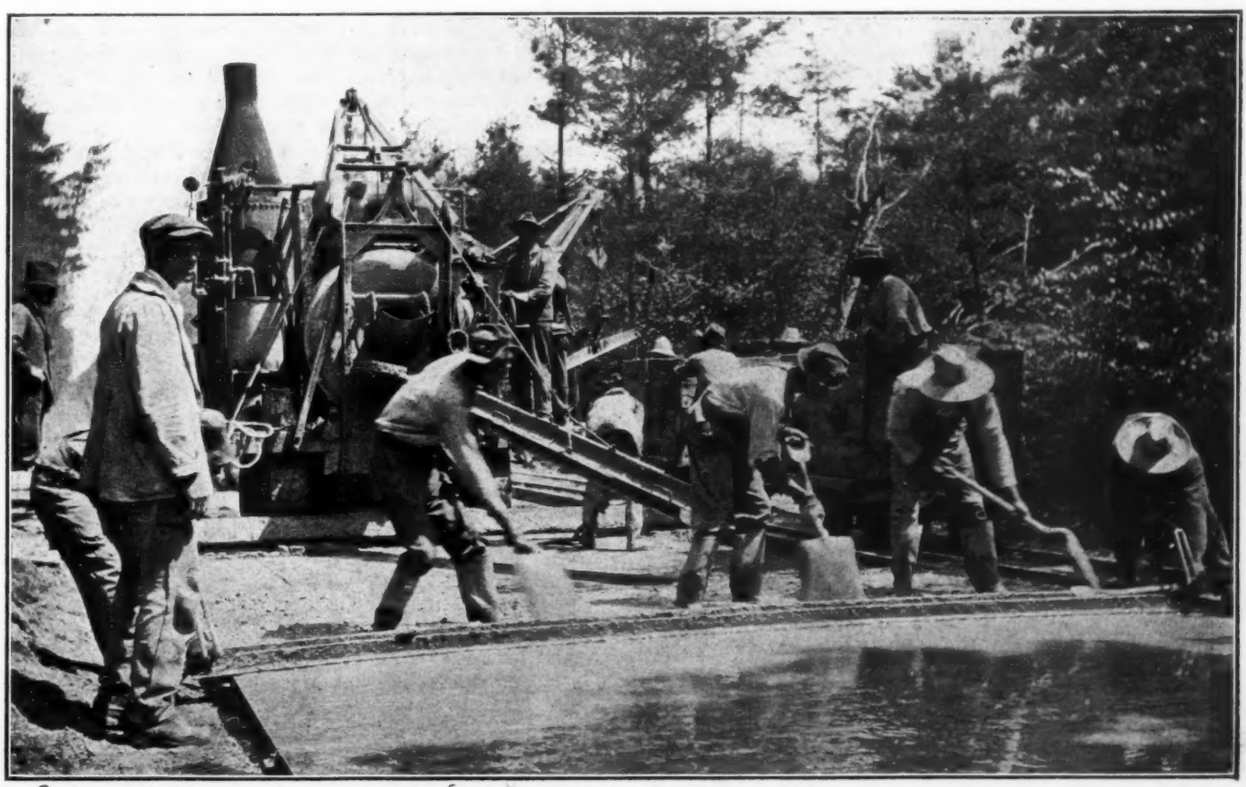
Stone and Sand Delivered in Measuring Boxes by Industrial Railway Direct from Railroad to Mixer, Eliminating Wheelbarrow Work—No Expansion Joints Provided—Fresh Concrete Protected by Screens.

The following description of the construction of a section of the DuPont road in Delaware is of interest, not only because of the methods employed by the contractor, but also on account of the fact that this road represents the latest principles of design and construction for concrete highways. The section described includes a ten-mile stretch extending from Georgetown to a mile north of Ellendale. The over-all width is 24 feet. The concrete pavement is 14 feet wide, 5 inches thick on the edges and 7 inches in the center.

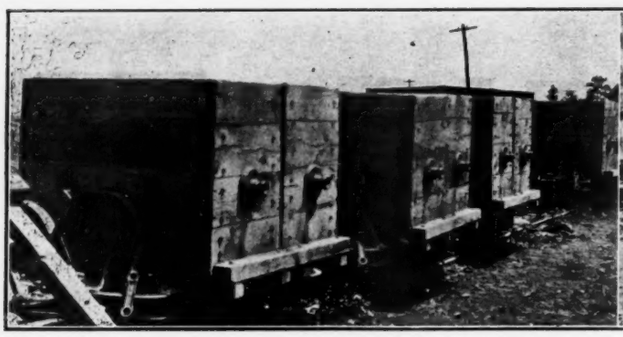
All the heavier excavation was finished last fall and winter, so that the only work of this sort now going on is fine grading, which is carried on just ahead of the mixing and laying work. The country is very level, and even on the heaviest grading most of the earth moving was done by hand, as cuts and fills were not deep enough to make the use of machinery economical. On one stretch a steam shovel was used, and in clearing and grubbing through Ellendale swamp, a distance of about two miles, stump pullers and explosives were used freely. The flat character of the country and the numerous drainage ditches made necessary a complete drainage survey, which included every ditch and water course within a mile of the road. This not only provided data for securing very good drainage, but also was economical, as a great many drainage courses were either diverted or consolidated.

The number of men employed on the fine-grading gang varied from 6 to 12, depending on the amount and kind of work to be done. Usually it was necessary to take only three or four inches off the surface and to shape the road, after which a 6-ton tandem steam roller was used to compact the sub-grade.

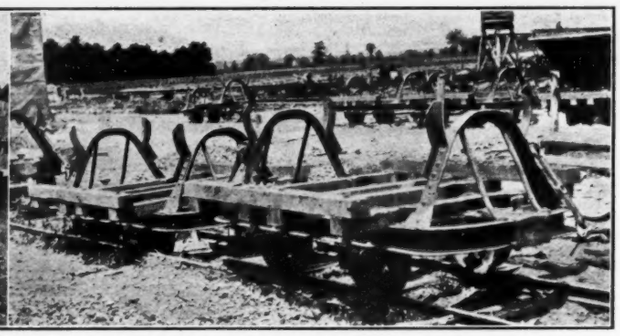
All materials are delivered by rail to unloading



CONCRETE MIXER AND GANG AT WORK, DU PONT ROAD



CARS CARRYING BOXES OF AGGREGATE.



CARS WITH BOXES REMOVED.

switches installed at stations most convenient for the contractor. The first location, at Ellendale, served the northern section of the road, while the present location at Redden is convenient for the remainder of the work. From the railway, all materials are delivered to the road by Koppel equipment.

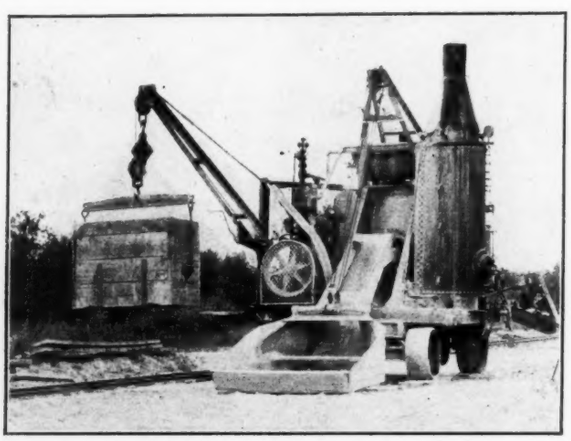
Sand and stone from the cars are loaded by shovelers directly into wooden boxes mounted on the Koppel cars. The side-dump bodies regularly furnished with these cars were removed and a frame of 2 x 4 timbers was placed on the chassis of the car. On this frame were mounted two wooden boxes, each having a capacity of 18 cubic feet. These boxes, as shown in the illustrations, are rectangular in shape and on each end have a cast iron trunnion by which they may be raised or handled.

A stock pile is maintained at the unloading station in order to provide a supply of materials in case of delay in securing the regular daily supply of sand, stone or cement. Except when necessary to draw from this pile, all materials are shoveled directly into the boxes. In the case of sand and stone, a bifurcated chute is used. the wide end being hung on the car with a leg discharging into each of the two boxes placed on the Koppel car. These boxes are filled with stone to a mark indicating that they contain 12 cubic feet each. The remaining space, 6 cubic feet, is filled with sand.

At the mixer a crane attached to the mixer raises the boxes one at a time and dumps them into the charging scoop, into which three bags of cement are then placed. The empty boxes are replaced on the cars and these cars are pushed forward to make way for other cars carrying filled boxes. A 1½-minute mix is prescribed, which makes the rate of charging the scoop about once in two minutes. This allows plenty of time to move the cars and operate the same, which is done by hand. This method removes the necessity of dumping the stone and sand on the sub-grade and then shoveling it into wheel barrows or other devices for transmitting it to the mixer. By means of it, the mixing and placing gang is reduced to 18 men employed as follows: Four men placing concrete; 2 men on the cutting template; 1 engineer; 1 fireman; 2 finishers; 2 men on the form; 1 man operating the crane; 3 men feeding cement and helping the crane man; and a foreman. The two finishers use a belt instead of a float to secure the required finish. The cutting template is made of a 4x8-inch angle iron, bent to proper crown with the 8-inch side next to the concrete. Working under average conditions, the above gang can lay about 600 feet of road a day.

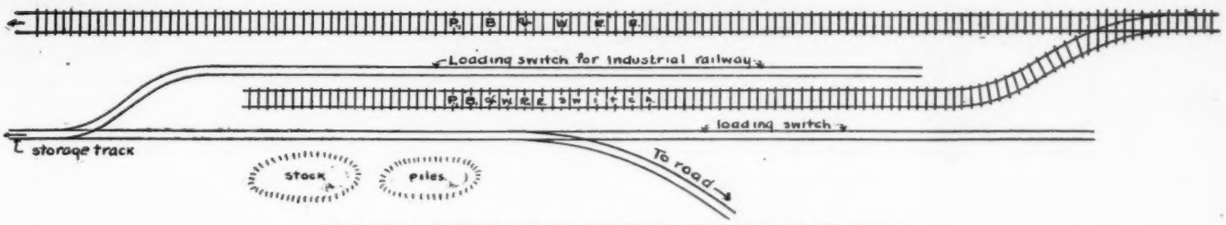
Transverse joints are placed only at the end of each day's work, the longest stretch to date without a joint being about 585 feet. The main joint is made by placing in between the side forms and perpendicular to the center line of the road an inch board cut to the true cross section of the road. Five slots are spaced along this board, allowing five ⅞-inch rods 3 feet long to be placed so that 18 inches are covered by concrete and 18 inches project. The concrete is struck off at this board and the next day the board is removed and the new concrete bonds with the old by means of these rods. The bond is strengthened by 2-inch bends placed at each end of each rod. No filler is used on this joint. The regular Kahn filler joint is used for an emergency joint during construction, as the joint board can not be removed until the initial set of the concrete or for a longer period. The cement used is Saylor's portland, with which "Limoid" is mixed.

The main factor in reducing the size of the crew at the mixer is the method of handling the industrial cars.



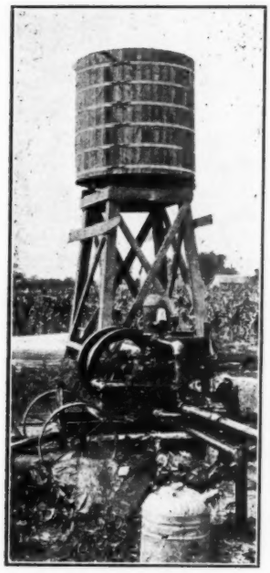
MIXER HANDLING 18-CUBIC FOOT BOX OF STONE AND SAND.

MIXER AND INDUSTRIAL TRAM; PLATFORM FOR STORING CEMENT IN FOREGROUND.



LAYOUT AT UNLOADING SWITCH AT REDDEN STATION.

The Koppel equipment included 20,000 feet of 24-inch, 20-pound standard track, 50 cars and one locomotive. All these cars are employed on hauling material. Equipped with wooden boxes, as described before, they are divided into three 16-car trains, each train being made up of two cement cars and fourteen sand and stone cars. While one train is being loaded by the shovelers at the unloading station, another train is being unloaded at the mixer and the third train is being hauled toward the mixer, if loaded; toward the switch, if empty.



PUMPING UNIT AND ELEVATED TANK.

As the empty cars at the unloading station are filled with sand and stone in the proper proportions, they are moved by mules to a side track, thus leaving the main track open for the load of empties coming from the mixer. These latter are delivered by the locomotive alongside the sand and stone cars to be filled, and the locomotive takes the loaded train back to the mixer. Here the process is the same. The cars, as fast as they are unloaded into the mixer, are taken by mules to a storage switch and these empties are taken back by the locomotive after it delivers the loaded train. The cement cars are usually placed in the middle of the train, but instead of being unloaded into the mixer, as in the case of the sand and stone, the cement is piled on a movable platform just back of the mixer. For the cement, the regular Koppel cars are used.

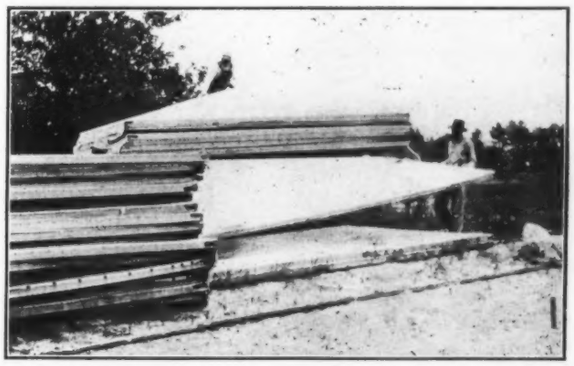
The success of this method depends to a large extent on a proper sequence of operations so that neither locomotive nor mixer is compelled to wait for the other. On the longer hauls, as well as on the very short ones, this is not always possible, but by the use of an additional mule to help out the locomotive at the unloading plant, there is seldom any delay.

Water is secured from wells driven at intervals of about a mile along the road. These are connected by a 2-inch wrought iron pipe line, with plugged tees placed at intervals of 150 feet as connections. Small elevated storage tanks are placed at intervals. In addition to furnishing a uniform pressure, their use obviates the necessity of running the pumps all the time. "Domestic" and C. H. & E. pumping units, driven by gasoline, are used.

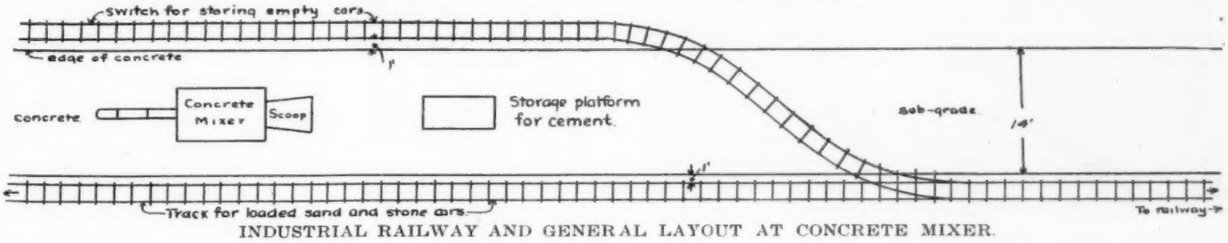
The sub-grade is of an absorbent nature and it is necessary to wet it thoroughly before laying the concrete. Immediately after placing the concrete, it must be protected from the sun. This is accomplished by means of muslin shades tacked on frames about 9x15 feet in size. These are equipped with flaps to hang over the ends and are placed about 6 inches from the surface of the concrete. They are left in place until the concrete has taken its initial set, when they are removed and the concrete covered with a 2-inch layer of earth. It is sometimes necessary on excessively hot days to sprinkle the muslin in order to retard the drying out of the concrete surface. The earth covering is thoroughly wet every day and is kept so for 14 days.

In addition to the Koppel equipment and the steam roller, the contractor, E. C. Humphrey, Inc., of Hackensack, N. J., uses a Chain-Belt concrete mixer of ½-yard capacity. Most of the teams are hired locally and most of the men also are secured from near-by sections of the country. During seasons when farm labor is much in demand, it is rather difficult to secure a sufficient number of men, but at other times there has been no scarcity.

The road is being constructed by General Coleman du Pont as a gift to the state of Delaware, and as each section of ten miles or more is completed, it is turned over to the state. C. D. Buck is chief engineer and J. H. Cosby is assistant engineer and in general charge. A. B. Sandidge is superintendent and has charge of the work for the contractor.



UNLOADING THE MUSLIN SCREENS.



INDUSTRIAL RAILWAY AND GENERAL LAYOUT AT CONCRETE MIXER.

MACHINE TRENCHING FOR WATER PIPES

Municipal Water Department Owns Machine, Which It Uses for All Trenching for Water Pipes—Record of Thirteen Days' Run.

By HENRY C. ALLEN, City Engineer, Syracuse, N. Y.

In establishing a recruiting camp near the city of Syracuse, it was decided to use for the water supply of the camp the public supply of the city of Syracuse. In order to do so it was necessary to extend the water main from the city to the camp with the greatest possible speed, since thousands of men were already on the ground without a proper supply.

In this emergency the quartermaster appealed to the city for aid and the city water bureau, through its superintendent, Charles A. Windholz, loaned its Buckeye trenching machine and the operators to dig the trench for the water main. The main was an 8-inch "universal" pipe, and the pipe was furnished and laid by the Edward Joy Co., of Syracuse. The trench was dug 4½ feet deep and 28 inches wide. The pipe line was located in a highway with a surface of macadam. The soil was principally clay, although some boulders and stone were encountered in places, which accounts for the small progress made on certain days.

The record of excavation was as follows, the machine working eight hours per day:

June 15	1,000 feet
16	850
17	950
18	850
19	600
20 (Sunday)	0
21	650
22	1,100
23	1,050
24	700
25	250
26	100
27 (Sunday)	0
28	800
29	260
13 days	9,160 feet

TRENCHING FOR WATER PIPE IN SYRACUSE.

Trench 4½ feet deep and 28 inches wide. Gravel soil with some boulders; 6 inches of concrete on the surface.

The cost of operation was $152.42 for labor, $76.80 for repairs to the machine and new parts, and $109.60 for gasoline and oil; a total of $338.82. This averages about 3.7c. per foot. It will be noticed that this is the cost of operation only and does not include any interest, depreciation or other overhead charges. It is estimated that the work done by this machine, which averaged about 700 feet per day, would have required 46 men had it been performed by hand labor. The trench was backfilled by hand.

The machine that was used is, as was stated, owned by the city water bureau and is used by it for excavating all trenches for water mains. It has three speeds, 1½ feet per minute, 3 feet per minute and 5 feet per minute. The soil in Syracuse is such that it is generally possible to operate it in the medium speed of 3 feet per minute.

STREET CLEANING IN HOUSTON

Motor Sprinklers Do Work More Cheaply Than Mule Drawn—Costs of This and of Sweeping—Pick-Up Work.

In his annual report for 1916, Matt Drennan, Commissioner of Streets and Bridges of Houston, Tex., gives figures showing the economy of motor sprinklers on street cleaning work. A motor sprinkler operated at a daily cost of $9.50 sprinkled 250 blocks twice daily and 57 blocks four times daily, a total of 1,083,000 square yards of street surface. In 1916 the machine was operated 262 days, sprinkling 283,746,000 sq. yds. of surface at a cost of 1 cent per thousand square yards. The items of cost were:

Chauffeur	$1,080.00
Gasoline	371.60
Lubricants	131.00
Repairs and renewals	1,255.40
	$2,838.00

Six mule-drawn sprinklers also were used on this work at a cost of $24 per day for mules and drivers and $1 for renewals, or $8,280 per year for 300 days' work and maintenance for 12 mules for the other 66 days. This equipment sprinkled 1,632,000 sq. yds. daily, or 489,600,000 sq. yds. during the season, at a cost of 1¾ cents per thousand square yards. The combined cost for mule and motor sprinkling was 1⅜ cents per sq. yd.

Sweeping by mules preceded by sprinkler cost $19.70 daily for 8 mules and 4 men, a total of $6,440 for 294 working days, and 52,000,000 sq. yds. of surface was swept at a cost of 12½ cents per thousand square yards. Two trucks, each trailing one sweeper, and preceded by a motor sprinkler, swept 300,000 sq. yds. daily at a cost of $25.45 for the trucks and sweepers and $9.50 for the sprinklers, a total of $34.95 a day. In 270 days, this apparatus swept 81,000,000 sq. yds. at a cost of 12⅛ cents per thousand square yards. The cost of operation was as follows:

2 Chauffeurs	$3,240
Gasoline	1,070
Oil and Grease	400
Truck renewals and repairs	2,255
Broom renewals anl repairs	1,175
Broom men	1,080
Foreman (half time)	490
	$9,710

Two combination sprinkler-sweepers, mule-drawn, swept 47,334,000 sq. yds. at a cost of $9.70 per day, or 6 2-3 cents per thousand sq. yds. White wings cost 22½ cents per thousand square yards. The pick-up gang in the business streets, consisting of 6 men and 6 mules, cost $19 per day. It cleaned 20,870,000 square

yards at a cost of 33¼ cents per thousand square yards and removed 2,184 cubic yards of sweepings at a cost of $1.10 per yard.

Both mules and motor trucks were used in general pick-up work. To operate 2 trucks, 2 chauffeurs, 10 men and a foreman were required. The cost of this outfit was $38.60 per day and the work done included picking up the sweepings from 128,700 square yards of street surface and removing an average of 21 cubic yards of sweepings. On 270 days' work 34,750,000 yards were covered at a cost of 31¾ cents per thousand yards, and 5,700 cubic yards of sweepings were removed at $1.91 per cubic yard. The daily and annual cost was:

	Daily	Annual
Two Chauffeurs	$7.00	$2,160
Gasoline	3.60	972
Lubricants	1.00	362
Depreciation and repairs	4.00	1,080
Foreman	3.00	936
Ten Men	20.00	5,400
	$38.60	$10,910

Six mule teams, 12 men and a foreman proved more economical at this work than did the motor trucks. This gang cost $40.50 per day and picked sweepings from 185,900 square yards of surface, removing 45 cubic yards of sweepings daily. The total cost for picking up was 29 cents per thousand square yards and $1 per cubic yard for sweepings removed, operating 270 days.

The daily and annual cost was:

	Daily	Annual
12 men	$24.00	$7,056
12 mules	12.00	3,528
12 mules idle 72 days		864
Foreman	2.50	810
Repairs and renewals	2.00	600
	$40.50	$12,858

TOOTHING OUT BLOCK PAVEMENTS.

The Department of Public Works of Baltimore, Md., has recently adopted the use of a chipping hammer operated by compressed air for toothing out granite block and vitrified brick pavements when making repairs to cuts that have been made in such pavements or at other places. The highways engineer, R. M. Cooksey, to whom we are indebted for this information, says that there is no doubt the same appliance would give good results in making similar repairs on concrete pavements, although they have not yet used it for that purpose.

The outfit employed in Baltimore consists of a Number 2 portable compressed air outfit, with hose connections for hammers, sold by Chris D. Schramm & Son, and two Number 2 Thor chipping hammers purchased from the Independent Pneumatic Tool Company. Three hammers were purchased so that one could be held in reserve in case one of those in use should get broken or out of order. The average day's work for this outfit is 300 lineal feet of toothing at $6.79 per day, or 2.26 cents per foot. The total cost is made up as follows, the prices for material and labor being those of 1916, which will be slightly increased for 1917:

5 gallons of gasoline	$1.05
1 gallon of cylinder oil	.26
1 gallon of polarine oil	.23
1 special laborer	2.50
1 special laborer	2.75
Total cost per day	$6.79

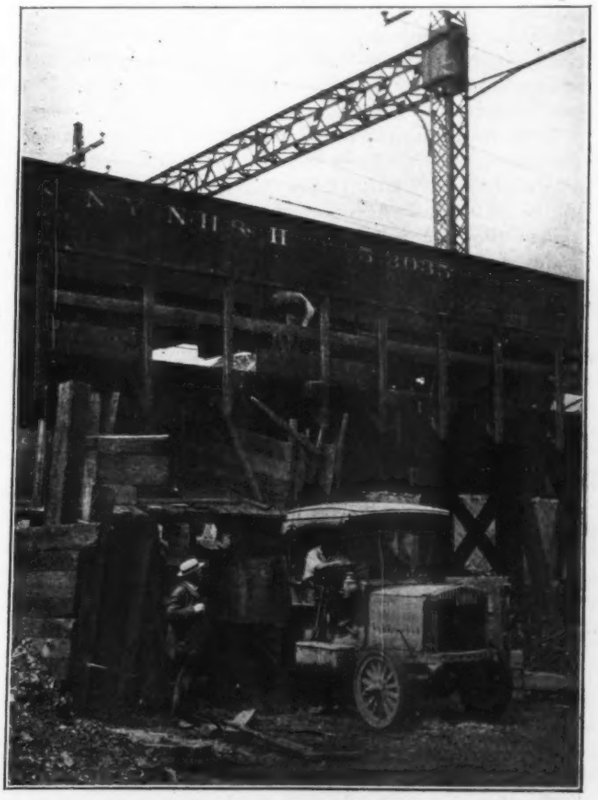
In doing this same kind of work by hand, the city used stone cutters in preference to laborers, finding the former to be more economical because the laborers ruined so much good paving. In this hand work, the average day's work for a stone cutter was 26 lineal feet of toothing. As he was paid $4.50 per day, this gives about 18 cents per foot, as compared to 2.26 cents per foot with the machine. In this calculation, Mr. Cooksey does not allow anything for interest and depreciation on the machine, but even allowing for a very short working season and short life, it does not seem possible that the addition of this would anywhere near double the cost; so that the cost of hand work would apparently be at least four or five times as high as that by the pneumatic machine.

MACHINERY REPLACES MEN ON CONCRETE ROAD BUILDING

Hand Grading Eliminated by Use of Road Grader—Motor Trucks Used to Transport Materials—Unloading Sand and Stone.

In building a concrete road between Milford and Devon, Conn., the contractors, R. D. Daley & Co., of New Haven, are hiring good men where they are needed, but are using machinery to reduce the number necessary to carry on the work economically. About 35 men are now employed on the job, which consists of laying 5 miles of 18-foot single course concrete road, reducing the grade on one hill and moving a trolley track from the side to the center of the road. The latter part of the work is to be done for the village of Milford. This has not yet been reached and so far the work has consisted of tearing up the old macadam road, removing about three inches of the top material and laying the concrete pavement. The problem of construction is simplified by the fact that traffic is by-passed and no provision has to be made for caring for it.

A feature of the job is the elimination of hand work on grading. The old macadam surface, which was badly



LOADING STONE INTO TRUCKS FROM COAL TRESTLE AND TEMPORARY BIN.

rutted, was broken up by means of a scarifier attached to a Buffalo Pitts roller. About three inches of the surface had to be removed, the sub-base made flat and rolled. A "Little Giant" road grader shaved off the surplus material, moving it to the sides of the road, and leveled the base so that practically no hand work was necessary. This grader will be used on all work where the cut does not exceed 6 or 8 inches. The heaviest grading on the whole job is about 3 feet and the average for the heavy grading, which covers only a short section, is about 20 inches. On this work a Keystone traction excavator will be used.

No local sand is available and it is necessary to secure all construction materials from outside. The sand is obtained from the Phoenix Sand & Gravel Co., of New York, and is shipped from Long Island in scows. These are unloaded by means of buckets or skips lowered into the scows and shoveled full by the men. By using several skips, no delay occurs in loading trucks, except the time required to hoist and dump the loaded buckets. On this work two horse-drawn trucks and two motor trucks, one Locomobile and one Riker (also made by the Locomobile Co.) of about 8,000 pounds capacity, are used. The motor trucks have proved very economical and are used for practically all the hauling, even where the haul does not exceed half a mile.

Stone is furnished by the Connecticut Trap Rock Co., and is brought in by rail. It was the original intention to unload the stone by shoveling from the cars directly into the truck; but the contractors were able to rent space at an overhead coal trestle, where a bin was rigged up so that the cars of stone could be dumped into it by gravity and the stone discharged from it by chutes into the trucks. This afforded a quick and economical method of loading, the average time required for loading a 4-ton truck, including that occupied in backing into position, being about 4 minutes. The average load is about 5 tons and on shorter hauls this is increased. On a 1-mile haul the usual schedule is: loading, 4 minutes; unloading, including turning and backing, 3 minutes; in transit, 20 minutes. On this haul the trucks average about 10 tons per hour each.

Cement is shipped in by rail and is usually hauled by teams to a distribution storehouse. This storehouse is one designed by Mr. Daley and is constructed of built-up sections, bolted together. The sections are so designed that when taken down they may be transported easily, and with them houses or sheds of any desirable size may be constructed quickly. The salvage value of the timber used in them is high.

Water is secured from the municipal water supply system and is furnished along the road through a 2-inch wrought iron line. Plugged tees are used in place of couplings at intervals of about 100 feet. These allow a ready supply of water.

The road is constructed 6 inches thick at the edges and 8 inches at the center and the concrete is mixed 1:2:4, Knickerbocker portland cement being used. Twenty-five men are required to operate the Koehring mixer. The make-up of the mixing gang is as follows: 4 men shoveling stone, 4 men wheeling stone, 2 men shoveling sand, 2 wheeling sand, 1 man wheeling cement, 1 man emptying cement, 5 concrete spreaders, a foreman, an engineer, a fireman, a finisher and 2 form men. This gang can turn out somewhat over 300 feet of finished road a day, but lately the non-delivery of stone has handicapped and delayed the work.

Expansion joints composed of a double thickness of tar roofing paper are placed every 35 feet. Wooden forms, made of 2x6-inch timbers are used. After placing, the concrete is brought to the proper cross section with a template and then given a wood float finish. Before the final set the surface is broomed and is then covered with earth and allowed to cure for about 10 days.

SOME ROAD GRADING WRINKLES

Street Grading With Wheel Scrapers and With Steam Shovel—Scarifier and Scraper Hauled by Road Roller—Removing Trees.

Some facts and figures concerning the grading of street roadways in contract work done by him has been furnished us by G. W. Lawrence, a contractor of Newark, N. J. As Mr. Lawrence points out, each job is a problem in itself and the contractor must meet conditions as they arise; but the suggestions offered by the methods of others will frequently assist in meeting those conditions.

In one job recently completed, this company used four Baker-Maney 4-wheeled scrapers, each of one cubic yard capacity, using a hoisting engine instead of a snap team for loading the scraper. The total amount of excavation in this job was 4,156 cubic yards. The dump was about 750 feet way, making the average round trip of the scraper 1,500 feet. These scrapers averaged about 40 trips in a

CONSTRUCTION WORK ON ROAD BETWEEN MILFORD AND DEVON, CONN.

9-hour day. The final cross-sections of the work, when compared with the total number of loads, showed that the average amount carried was just about one cubic yard per load. The soil was part top soil and part clay and the depth of excavation averaged about four feet. The daily cost of moving 160 yards was as follows:

One foreman	$5.00
One snapman	3.00
One hoisting engine	4.00
One engineer	2.00
One-third ton coal	2.00
Oil and water	.50
Repairs	.35
Four scrapers (1 c. y. capacity)	28.00
One plow team	7.50
One plow man	3.00
Depreciation on 4 scrapers	6.00
Total cost per day	$63.00

This gives about 40 cents a cubic yard. This cost could have been reduced by using two more scrapers on the work, as the four scrapers did not keep the loading engine busy, and the plow team could have loosened from 350 to 400 cubic yards per day.

On another piece of street excavation being carried on at about the same time, the contractor used an 18-B Bucyrus steam shovel and teams which made a round-trip haul of 2,000 feet. In this case the cost per cubic yard was 47 cents. The increase over the cost by scrapers is accounted for by the expense of moving the steam shovel in and out again, and a daily charge of $15 a day against the shovel for wear, repairs and depreciation and full time for the crew during rainy weather, as against $6 a day charged against the four scrapers. On a short haul, the 4-wheeled scrapers have the advantage over the steam shovel of saving the expense of planking the pit and building a pontoon for the shovel, soil conditions being equal.

Hand labor was replaced in street grading by this firm by using a Peerless 10-ton roller with a scarifying attachment, behind which was drawn a team and a Baker-Maney scraper, scooping up the soil which had been loosened by the scarifier. This was used for final grading after the steam shovel work had stopped, and such grading was done in this way as low as 2 cents a square yard.

On another piece of work it was necessary to remove 110 trees in the right-of-way, these trees averaging two-foot trunks and being very high. The trees were removed with four men at $3 each and a foreman at $5 by employing a steam roller to pull them down and break them up. The wood when broken up was removed by a 3½-ton Packard. The average cost per tree was $10.

SEWER CLEANING IN ABERDEEN.

Included as a part of the sewer system of Aberdeen, S. D., are four blocks of 10-inch storm sewers, which the city has had considerable difficulty in keeping clean. Efforts were made to flush the sewer and also to pull an auger through it, three men and a team being used in the latter effort; but no considerable part of the dirt was removed in that way, and the sewer remained in a very unsatisfactory condition. The city engineer, Frank Le Cocq, informs us that he concluded, a few weeks ago, to try some other method, and a Kuhlman sewer cleaning machine was obtained. In order to use this it was necessary to force a string of rods through the sewer, and this required some time, as the sewer was found almost filled with mud. Once a passage had been forced through the sewer by means of the rods, however, the machine, operated by four men, cleaned about 100 feet of sewer a day, removing about 35 cubic feet of mud. Mr. Le Cocq reported that up to the time of writing, June 22, this gang had cleaned four blocks of 10-inch storm sewer. He believes that now that the men have learned how to use the machine, they can perform such work more quickly in the future.

MODERN ROADMAKING MACHINERY*

Types and Capacities of Machines to Be Used on Different Kinds of Construction—Care and Use of Machinery.

Road construction is carried on under widely varying conditions and the selection of machinery for the work involves a careful study of these conditions. The capacity of the machines to be purchased, the power required and the most desirable weights for rollers, should be determined in advance. Equipment once used and found unsuitable cannot be sold or exchanged except at a heavy discount.

The ordinary operations in the construction of country roads are grading, quarrying, crushing, hauling, watering and rolling. Each of these operations can be performed by up-to-date machinery as against more primitive methods formerly in use. For ordinary grading operations, work far superior to that done under the old method of shovel and scraper is now obtained from the use of grading machines and in less time. Steam or compressed air has superseded hand work for drilling.

Efficiency demands that stone placed on the road be rolled and finished immediately, for if but partly finished, it is sure to be disturbed by traffic and much of the work undone. The spreading and partial rolling of long stretches of stone is the cause of much unnecessary expense. Economical practice also requires that both crusher and roller be working to capacity, but that the roller be not rushed to such an extent as to encourage inferior or half-finished work.

A common source of loss in crushing road material is the attempt to operate a crusher of too limited capacity. Selection of a suitable size of crusher should be based more on the jaw opening than on the rated capacity. The daily output of crushers with jaw openings less than 9 inches by 16 inches or 10 inches by 18 inches has been found too limited to satisfactorily supply the average road making outfit, and smaller machines should not be considered. Similarly, the motive power should be sufficient to drive the machine at full speed under full load. The time lost per day due to slowing down when the load becomes heavy amounts to a considerable total. Frequently the boiler may also supply steam to run a rock drill or other machine, under which conditions ample capacity becomes necessary. Where a portable or traction engine is used, it should not be less than 20 horsepower.

Special attention should be given to the lubrication of the crusher. The conditions under which such a machine works are severe. Owing to dust, automatic oiling devices have not, in general, been found reliable and good lubrication is better assured by frequent applications from an oil can. In hot weather a heavier grade of oil may be used than in cold weather.

Even with the best of care, the wear on crusher bearings is very rapid. In the selection of an outfit, a point worth considering is the ease with which bearings and other wearing parts may be replaced. Some crushers now on the market are supplied with replaceable babbitt bearings, which can be fitted in a few minutes. Ordinary

*Abstract of paper read before the Fourth Canadian and International Good Roads Congress by W. Huber, Assistant Engineer, Ontario Department of Highways.

chilled cast iron jaw plates wear rapidly. In spite of a much higher initial cost, jaws of manganese steel are cheaper in the end and, by reason of much slower wear, give a more uniform product.

The selection of screens for separating the crushed stone is important. For road work, two screens giving three sizes of stone are advisable, the sizes depending on the character of the stone. With limestone the perforations giving best results are 3-inch and 1½-inch; for granite or trap, the perforations should be rather smaller, 2½-inch and 1-inch holes being satisfactory. A bad practice is the use of three screens, which gives four sizes, including a size ¾-inch to 1½-inch, which when used by itself is more detrimental than useful.

Rolling is one of the most important operations and judgment should be used in the selection of the roller. The weight will be governed principally by the sub-grade on which it will work. On old gravel or stone roads, a 12-ton roller may be used to advantage, but this size should never be exceeded on country roads, and where roads have not been previously metaled or where the sub-grade is not firm, better results will be obtained with a 10-ton roller.

Motor driven rollers have come into prominence in recent years and the choice between steam and gasoline or kerosene may well be considered. Owing to its longer and wider use, steam is more generally understood and heretofore it has been easier to find operators for the steam rollers. The condition is now changing and the motor roller is rapidly gaining favor. Advantages claimed for it are the elimination of delays incurred through the necessity of firing and taking on water, estimated at 1½ to 2 hours a day, and lack of smoke and soot. Provided with a competent operator, a motor roller can undoubtedly perform more work in a given time than can a steam driven roller.

If a steam roller is selected, it should be one with a double-cylinder engine. This type has many advantages over the single-cylinder which more than compensate for the slight extra cost. Combined with smoother running, they are able to start from any position.

The greatest wear on a roller is seen on the rear wheels, which soon become rounded. When this occurs consolidation is slower and not so well done. With rear wheels having detachable rims, such as are supplied in some rollers, the cost of renewing rims is much smaller than where the entire wheel must be purchased.

The roller is, or should be, the limiting factor of the organization and, as it is an expensive part of the outfit, it should be worked to capacity. For this reason, a capable operator is a good investment. Rolling must be performed so that each passage of the roller accomplishes something in the final consolidation of the stone. Careless or inefficient handling will not only increase the work necessary for the final consolidation but will give a less satisfactory result. Excessive rolling wears the sharp edges off the stone, thereby destroying an important factor in the prevention of internal movement.

Satisfactory consolidation can be secured only when stone is confined at the sides. Unless a shoulder is furnished to keep the stone within the required width, the weight of the roller will cause it to spread. A shoulder may be formed by the grader, or, where the sub-grade is of old metal which it is desired to leave undisturbed, a small trench may be picked at the edge.

Efficiency and economy of rolling depend on continuous operation. Delays due to lack of water may be prevented by the use of two tanks. Considering how much delay may be so caused, the cost of operating the extra tank is negligible.

As a means of moving large quantities of material, team haulage is fast losing its importance. The increasing wages of men and teams has made this method almost prohibitive and it is being replaced by mechanical traction. The cost of team haulage is usually between 20 cents and 40 cents per yard-mile, averaging 25 cents to 30 cents on country roads. Under very favorable conditions, mechanical haulage has been accomplished for 5 cents per yard mile, while a fair average is about 8 cents to 12 cents.

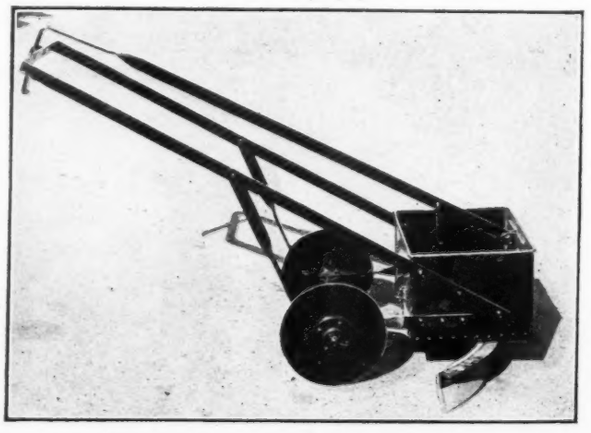
A common mistake in the puraches of hauling machinery is that of selecting equipment which is too large and too heavy. Traction wagons for country roads should not exceed a size of 3 or 4 yards. The larger sizes are too heavy for some roads and are more difficult to handle. Better results can generally be obtained by reducing the size of the cars and increasing the number. If two or three large cars are used for trailers, the dropping of one car on account of a hill or bad section of road means a large percentage of reduction in the paying load. Nothing but reversible cars should be used.

The entrusting of general care and repairs to the operator of each machine is inefficient and extravagant. Continuous and efficient operation of equipment can be assured only when responsibility for the condition of the entire outfit is centered in a capable master mechanic. He should frequently inspect each machine and supervise all repair work. A reasonable stock of repair parts likely to be needed should be kept on hand.

Care of machinery during periods of idleness is almost as important as its care during operation. A few months' exposure to the elements or to conditions promoting rust will cause more depreciation than a whole season's legitimate use.

APPLYING TAR TO WOOD BLOCK PAVEMENT.

The use of a small squeegee machine operated by hand for applying a flush coat to bitulithic and bituminous macadam pavements generally is more or less common; but such a contrivance has recently been used for applying a flush coat of tar to creosoted wood block pavement in Dayton, O., by Ed. Ryan, contractor for the paving; and we believe that one or two other contractors are using the same contrivance (leased from Warren Bros. Co.) for the same purpose. This flush coat machine consists of a small tank for holding the heated tar, under which is fastened a rubber squeegee, the tank being supported by two wheels, and partly by the squeegee when no pressure is exerted on the handle. An opening in the bottom of the tank, provided with a tapered plug, permits the tar to flow onto the pavement just back of the squeegee, which is then spread by drawing the contrivance backward.



FLUSHCOAT SPREADING MACHINE.

The squeegee having the shape of an arc of a circle, the tar is drawn ahead rather than flowing out at the ends. When seen by the writer, one of these squeegees was spreading a uniform coat of tar as fast as a man could walk—say 250 feet a minute.

FLUSHER DISPLACES LABORERS AND TEAMS.

Erie, Pa., in May last purchased a motor-driven street flushing machine which weighs four tons without the load and carries 1,200 gallons of water. The machine is operated by gasoline and was furnished by the Tiffin Wagon Co. W. D. Kinney, superintendent of the Department of Streets and Public Improvements of Erie, states that since receiving the wagon they have been trying out routes and systems of operation and have not yet determined the most efficient method of using the wagon and therefore can not give any definite figures concerning its operation. He states, however, that by using it they have eliminated from the street cleaning service 12 laborers and 4 teams, thus saving $61 per 10-hour day. The men so displaced were put on construction work, chiefly putting the dirt streets in condition by crowning and grading them.

MACHINERY ON A NEW YORK HIGHWAY

Grading With Plow and Scraper—Motor Truck Hauling and Spreading—Asphalt Distributors—Rollers as Tractors—Oil Hauled at Night—Handling Stone by Gravity at Quarry.

By W. HARDENBERGH.

Handicapped by a lack of labor and by abnormal, almost continuous rainfall and interrupted by heavy traffic which could not go on other roads because of the lack or poor condition of detours, contractor Nathan E. Young, of Binghamton, N. Y., has had to employ considerable labor- and time-saving machinery and devices in resurfacing the 14-foot macadam highway between Jeffersonville and White Sulphur Springs, N. Y. This stretch of highway includes part of state road Number 699 and part of road Number 700 and covers three contracts for repair work. The total mileage is 10.6 and the contract price approximately $70,000.

Work on this road was begun last fall on the Jeffersonville end and about two miles had been completed before winter set in. This spring, as soon as the frost was out, work was started again. This road, the main highway between Liberty, a railway town, and an inland farming district, has heavier traffic, both wagon and automobile, than any other road in that section. In the spring or in times of heavy rainfall, heavy wagons and automobile trucks not infrequently do serious damage to the surface and, as a result, the road soon breaks up. For this reason it was thought necessary to place a Telford type sub-base wherever the macadam had been worn away entirely or the bottom seemed faulty. The installation of 5,100 yards of 6-inch sub-base, as called for in the specifications, has necessitated the tearing up of the old surface in many places.

The work of tearing up the old surface was done with a Syracuse pavement plow attached to a 15-ton Kelly-Springfield roller, which is used also for rolling the sub-base. After the old surface has been broken up thoroughly, a Climax scraper is attached to the roller and used to scrape the loose dirt to the sides, forming a shoulder of sufficient height to retain the sub-base and the stone courses. Three men are required to hold the plow and two men to operate the road scraper. The contractor estimates that on fairly long stretches the use of this scraper saves from forty to fifty men.

Common field stone, such as are found in stone walls or on the surface of the ground in pastures, are used for the bottom course. Two trucks are required for hauling and three men to load the trucks. The stones are dumped along the side of the roadbed, sometimes toward the middle, and placed by hand. Usually only one-half of the roadbed is covered at a time, in order to allow traffic to pass with least difficulty. Then the road is finished gradually. The stones are pounded with sledges, then covered with gravel filler to the depth of an inch or two and rolled. The gravel is obtained from a pit nearby and hauled by wagons and motor trucks. With six men shoveling, the five-ton automobile trucks are loaded in twelve minutes.

Where no sub-base had to be installed, the old surface was scarified with an Acme scarifier and then reshaped with a scraper and by men with rakes. After rolling the surface, a course of Number 1 stone, sufficient to make three inches when consolidated, was added and then rolled.

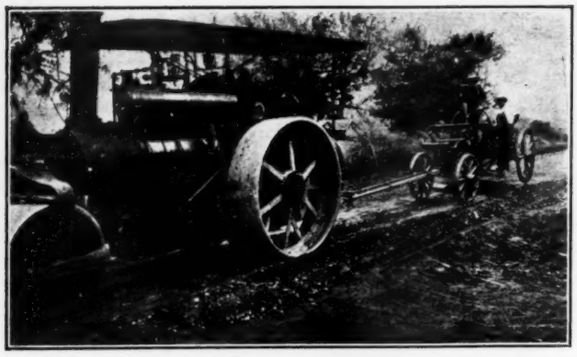
Except where the hauling was close to the crusher, motor trucks were used to haul and distribute the stone. Two five-ton White spreader trucks were used. It took an average of 2 minutes to load these trucks from the crusher bins and unloading required a minute to get into position and about half a minute to spread the load. Only one man is required to level off the stone where these trucks have spread their load.

On short hauls, where horse trucks are used, from four to six men are needed to distribute the stone drawn by two trucks and dumped in rows along the roadbed. Except on the short hauls, the motor trucks in every way demonstrated their superiority over the horse-drawn vehicles.

A coat of John Baker, Jr.'s Texaco Oil is applied on top of the coarse stone by means of two asphalt distributors of 660 gallons capacity each, both equipped with air compressors and fire boxes. The temperature called for in the specifications is from 250° to 350° F., and the contractor applies the oil at a temperature of from 275° to 300°. The 660-gallon tank covers approximately 300 feet of surface. The tanks are drawn by a ten-ton Monarch roller, which is used at other times for rolling the stone. A steam connection from the roller operates the air compressor on the tanks.

As soon as the oil is applied, six men spread on Num-

TRUCK SPREADING STONE.

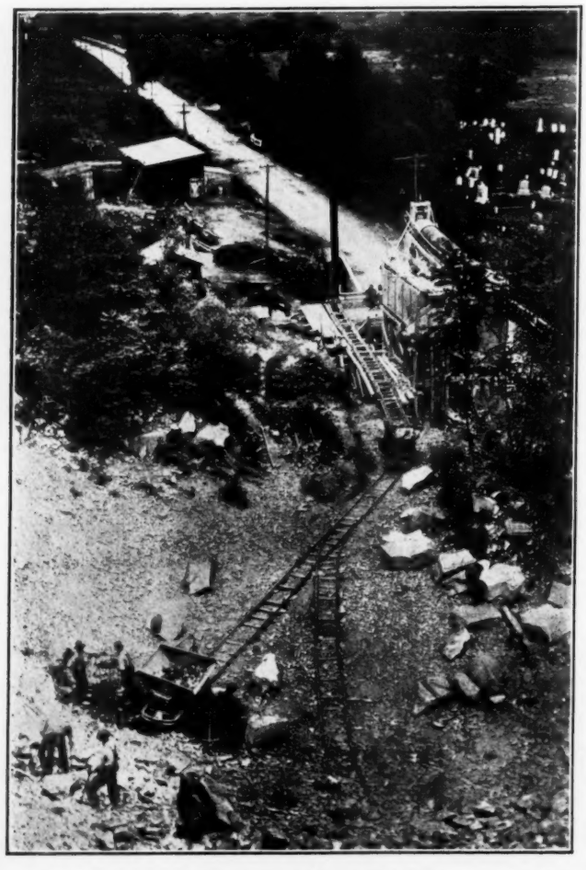


SPREADING STONE WITH SCRAPING GRADER.

ber 2 stone from piles which have been dumped conveniently alongside the road. The road is rolled thoroughly. Within a few hours another coat of oil is applied to this surface, covered with the finest grade of stone and then thoroughly rolled. When the rolling is complete, the finished road should have a five-inch crown.

The oil has to be brought a distance of twelve miles from Callicoon. For this purpose the White trucks are used. The material in the cars at Callicoon is heated with steam to keep it mobile. The trucks make about three trips in a ten-hour day, although they are used more frequently at night, when the oil is brought to have on hand when the men begin work in the morning.

For the first part of the road, 83,000 gallons of Texaco are being used. Ninety thousand gallons of Standard Bituminous Material A will be used for the rest of the [illegible].



QUARRY PIT, CRUSHER PLANT, AND TRACK CONNECTING THE TWO.

By using the two White motor trucks, twelve horse-drawn trucks have been displaced. Mr. Young still has sixteen Champion trucks on hand, but hardly ever finds it necessary to use more than four of them. The average mileage of each truck for a ten-hour day is from 60 to 75, although frequently they make from 100 to 105 miles a day, 110 being the maximum. On long trips they average five miles to the gallon of gasolene and four miles on the shorter trips and on the trips to Callicoon, with the oil distributor as trailer.

In hauling stone, the contractor finds that the motor trucks will make from eight to ten trips each ten-hour day to the White Sulphur Springs end, which is a distance of six miles, or twelve for the round trip. Included in this distance are two long, heavy grades.

The crusher plant is situated with a view to saving labor. A rock ledge close to the road was selected and the crushing outfit erected there. A Climax No. 2½ crusher is used. It has been in use for seven years and gives complete satisfaction to the contractor.

The ledge is situated far enough up and above the crusher to make possible the use of two Koppel side-dump cars and 180 feet of track, and give just enough slope to the track to permit bringing a loaded car down the track by gravity. A Wood steam drill is used to drill the ledge, which is broken up with explosives. The workmen load the blasted stone into a car, which is taken by two men down to the feeding pit of the crusher and dumped, and the two men push the empty car back by hand. Meanwhile, on a Y-branch track, the other car has been loaded and is ready to be brought down. With these two cars, three men are kept busy at the feeding pit. The contractor believes that the gravity arrangement saves at least three and possibly four horse cars.

Care in drilling the holes results in finely broken stone and few boulders. A small-diameter drill is used and the holes are sunk close together. The stone is a blue sandstone, well adapted for road-building.

An item of economy not to be overlooked is the arrangement of the Koppel track alongside the crusher bin to permit of the loading of a car with the coarse material in the end bin which has failed to pass through the cylinder screen meshes. Commonly this stone is dumped on the ground or used as sub-base.

From eighteen to twenty-two men are employed at the crusher, the majority of them for loading the Koppel cars. Eleven men are employed for sub-base installation, three of them for loading gravel filler, three for holding the breaker plow, one man for spreading the filler, and the rest for loading or placing the stone. From eight to ten men are required in the gang which constructs the macadam surface. One or two of these are used for spreading the stone and others at various jobs, such as raking stone, forming shoulders, or covering oil.

DUMPING QUARRY CAR INTO CRUSHER PIT.

The road scraper is used for whatever grading or dirt work has to be done and the contractor estimates that it does more than 75 per cent of the work which formerly was done with shovels.

In places where the roadbed is badly worn, or where the ground is springy, the sub-base is often put in to the depth of eight inches or a foot.

The contractor finds that passing traffic causes much trouble, especially on unbound stone. He says that it is impossible to smooth out the ruts made in loose stone by heavy wagons or automobiles anywhere near as well as it was originally. The traffic also interferes with the work and often causes a loss of time. But detours are either lacking or else in poor condition and the contractor finds it impossible to shut the road. The only remedy is to spread stone only as it can be bound and rolled.

EXPLOSIVES FOR LOOSENING SOIL.

While in some sections and among certain contractors the use of dynamite or black powder for loosening the soil and facilitating its removal is more or less common, its use is probably not nearly so general as it might be advantageously. For removing stumps and boulders its value is generally recognized but it has been found economical in many cases to use it in excavating drainage ditches along the sides of roads and in assisting grading down to the road level.

Where a ditch is to be dug in hard soil, this may be loosened and to a considerable extent blown out by punching a number of shallow holes along the line of the ditch and charging these with small amounts of dynamite. The holes should be deeper than the bottom of the ditch and can be spaced two or three feet apart. Where the ditch is in saturated soil, it is recommended that the holes be placed about 18 to 24 inches apart and 50 per cent dynamite be placed at a depth a little less than that of the ditch. One hundred or more of these charges may be fired with a single cap. If the ground is dry or cold, the holes are punched further apart and loaded with low-freezing explosive, each charge being primed with an electric blasting cap so that all may be fired at one time. For small ditches, quarry powder or other with similar characteristics will give good results. A single row of holes can be used to blast out a ditch from 1½ to 4½ feet deep and from 4 to 7 feet wide in dry soils and 5 to 9 feet wide in wet soils. If wider ditches are required, two rows of holes 3 or 4 feet apart, fired at the same time, can be used.

Where a road passes through low and poorly drained stretches where there is no economical means of draining off the large amount of standing water (and the water must be removed if the roads are not to remain wet and swampy a greater part of the year), this condition can be relieved by "vertical drainage" if there is a porous stratum a short distance below the impervious stratum which holds the water and causes the swampy condition. To drain the water down to this porous stratum (which will carry it away), it is necessary to provide numerous openings through the hard pan or other impervious surface stratum. This can be done by driving a number of holes, but it is less expensive to break up the material into numerous cracks by the use of explosives placed in holes carried at intervals down to the porous stratum. This method can not be used, however, where there is much quicksand or slimy silt above the impervious material, since this semi-fluid material will run down into the cracks and fill them up. Under these conditions it is necessary to open a rough well or crater down to the porous stratum and fill this up with brush, stones or other porous matter, the hole being then covered with porous top soil.

Still another method of using explosives is in making deep cuts, as in grading or widening a road. In this case the excavation is given a comparatively vertical face or bench and a line of holes is drilled or punched down from the top parallel to the face and spaced back a distance about one-quarter greater than the depth of the cut and about the same distance apart. The holes are loaded with low strength dynamite (20 or 30 per cent), the amount used in each hole depending on the hardness of the ground and depth of hole. If the cut is deeper than 6 feet, the holes are seldom placed more than that distance from the face. The holes should not be carried below grade as this may loosen the sub-grade too much. With low grade explosive the hole may be filled about one-half full of dynamite and carefully tamped to the collar. A number of holes should be fired at once with electric caps, as better results are obtained in this way.

On some road work in Pennsylvania last year one contractor used dynamite for blasting outfall drainage ditches; he also used it for loosening the ground ahead of the steam shovel, which permitted speeding up the action of the shovel. A trial of explosives used in this way convinced him that it was more economical than relying entirely upon picks, plows and hand shovels for this work.

MOTOR VEHICLES IN MUNICIPAL WORK

Kinds of Work They Are Used For and by What Departments—Loads Carried and Detailed Costs of Operation—Municipal Garages and Repair Shops—Motor Trucks and Roads.

Of the hundred or more cities reporting in reply to a questionnaire recently sent out by Municipal Journal, regarding the use and maintenance of motor vehicles by the municipalities, 13 maintain municipal garages and 21 have municipal repair shops. About 35, or half of those having motor vehicles, keep more or less accurate record of the gasoline and oil used, repair costs and other expenses.

In the majority of the cities, reports indicate that the use of the trucks does not damage the roads, but ten of the cities report damage and four others "slight"; nine cities, all in the north, report that they are unable to use motor vehicles in winter; four do not use them "all" the time and one not off paved roads in the winter. Only one makes any distinction in the uses of trucks on paved and unpaved streets.

In 26 of the cities, motor trucks are used by the street department, in 15 by the public works department, in 16 by the water department, in 10 by the police department, in 11 by the health or garbage and street cleaning divisions, and in 6 by the electrical department. In many of the cities, especially in the smaller ones, the trucks are used for a variety of purposes, as is indicated in Table I.

Only two cities, Hartford, Conn., and Asheville, N. C., report the use of electrics. Practically all the others are gasoline. The sizes include practically all from a light runabout to a 15-ton truck.

TABLE I—MOTOR VEHICLES OPERATED BY CITIES.

City and State.	Capacity.	No. of Each.	Kind.	Work Used on.	Dept. Used By.	Genl. Inform't'n.
Arkansas:						
Little Rock	.....	2	Ford	Trips with prisoners	Police	.....
	.....	1	Moon		Police	.....
	.....	3	Ford	Inspection	Health	.....
	.....	3	Ford	Inspection	Public Works	.....
	.....	1	Mitchell	Inspection	Street	.....
California:						
Los Angeles	2½-ton	9	Gasoline and Distillate	Collections	Garbage & Rubbish	.....
	5-ton	13		Hauling	St. Maint. & Replacing	.....
	2-ton	1		Materials	.....	.....
	1½-ton	1		and	.....	.....
	1-ton	1		Supplies	.....	.....
	2-ton	2		Sewer clean. & maint.	Sewer	.....
	¾-ton	1		Handling Material	Warehouse	.....
	1½-ton	1		Street Signs	Warehouse	.....
Pomona	.....	2	.....	General	Street & Park	.....
Redlands	.....	1	Ford	Waterwks. repair	Water	.....
Connecticut:						
Hartford	5-ton	1	Electric	Street work	Street	.....
Middletown	1-ton	1	Gasoline	Repair	Water	.....
Stamford	.....	1	Ford	Utility	Street	.....
	.....	1	Pope-Hartford	Ambulance	Police	.....
	.....	1	Overland	General	Police	.....
Illinois:						
Chicago	5-ton	1	Gasoline	Waterwks. Constr.	Yards and stores	.....
	2-ton	3	Gasoline	Waterwks. Constr.	Yards and stores	.....
	1½-ton	5	Gasoline	Waterwks. Constr.	Water Constr.	.....
	1-ton	9	Gasoline	Pipes & Meters	Pipes & Meters	.....
	.....	22	Ford	General	Various	.....
Cicero	.....	1	Ford	.....	Water	.....
	.....	2	Ford	Utility	Bldg. & Electrical	.....
Decatur	¾-ton	1	Gasoline	Sewer Cleaning	Sts. & Pub. Imps.	.....
	2-ton	1	Gasoline	Park	Park	.....
	2-ton	1	Gasoline	Police	Police	.....
	.....	4	Touring	Utility	Health & Engrg.	.....
Evanston	3½-ton	1	Gasoline	Street Repair	Street Repair	.....
	1-ton	2	Gasoline	Refuse	Street & Alley	.....
Peoria	.....	1	Mitchell	Supervision	Garbage	.....
	.....	1	Ford	Supervision	City Engr.	.....
	.....	1	Ford	Supervision	Street-Supt.	.....
	.....	1	Ford	Inspection	Dairy Inspector	.....
	.....	1	Ford	Fumigation	Health	.....
	.....	1	Ford	Ambulance	Health	.....
	.....	2	Maxwell	Inspection	Public Works	.....
	.....	2	Cadillac	Patrol & Amb.	Police	.....
	.....	1	Stearns	Emergency	Police	.....
Urbana	.....	1	Ford	Patrol	Police	.....
Indiana:						
Peru	.....	2	Ford	Patrol	Electric Light	.....
	.....	1	Motorcycle	.....	Police	.....
South Bend	1-ton	2	Gasoline	.....	Engineering	.....
	¾-ton	1	Gasoline	.....	Water Works	.....
	.....	5	Ford	.....	Water Works	Roadsters
	.....	3	Ford	.....	Water Works	Touring
	.....	2	Gasoline	.....	.....	Patrol
	.....	4	Touring	.....	.....	2 to 7 passenger
Terre Haute	.....	2	.....	.....	Police	.....
	.....	1	.....	.....	Street	.....
Iowa:						
Boone	.....	1	Ford	Utility	Police	.....
Burlington	.....	1	Gasoline	Repair Work	Street	.....
Massachusetts:						
Holyoke	.....	1	Gasoline	Flush. & Clean.	Public Works	.....
Norwood	¾-ton	1	Gasoline	Construction	Electrical	.....
	½-ton	1	Gasoline	Construction	Water	.....
	½-ton	1	Gasoline	Repair	Electrical	.....
	.....	2	Touring	Patrol	Police	.....
	.....	1	Touring	Inspection	Public Works	.....
Springfield	5-ton	7	Gasoline	Street Work	Streets & Engrg.	Two of these mchns. are used as tractors with 4 trailers.
	5-ton	1	Steam	Hauling Materials	Streets & Engrg.	
	2-ton	2	Gasoline	Sewer & St. Clean.	Streets & Engrg.	
	1-ton	3	Gasoline	General	Streets & Engrg.	
Michigan:						
Detroit	¾-ton	1	Gasoline	Garage Service Car	Public Works	
	1-ton	1	Gasoline	Sidewalk Repair	Public Works	
	15-ton	1	Gasoline	Street Cleaning	Public Works	
	1-ton	2	Gasoline	Asphalt Repair	Public Works	
	6-ton	7	Gasoline	Asphalt Hauling	Public Works	1 tractor and 9 trailers also are in use by the department.
	6-ton	5	Gasoline	Garbage Hauling	Public Works	
	2-ton	1	Gasoline	Garbage Hauling	Public Works	
	3½-ton	1	Gasoline	Garbage Hauling	Public Works	
	4-ton	1	Gasoline	Sewer Department	Public Works	
	1-ton	1	Gasoline	Sewer Department	Public Works	
	1-ton	3	Gasoline	Engineering Dept.	Public Works	
	6-ton	1	Gasoline	Paving Department	Public Works	
	7½-ton	1	Gasoline	Street Cleaning	Public Works	
Flint	7¼-ton	1	Gasoline	Flushing	Streets	Mack
	5-ton	2	Gasoline	Paving	Engineering	G. M. C.
	5-ton	1	Gasoline	Flushing	Street	Tiffin
Ironwood	.....	1	Gasoline	General	Public Works	Overland
Kalamazoo	.....	1	Ford	General	Water	.....
	.....	1	Haynes	Patrol	Police	.....
Manistee	1-ton	1	Gasoline	Miscellaneous	Water	Trailer is used
Marquette	5-ton	1	Gasoline	Clean. & Constr.	Public Works	.....
	1-ton	1	Gasoline	Line Work	Light & Power	.....
	½-ton	1	Gasoline	Wiring & Emerg.	Light & Power	.....
	.....	4	Gasoline	Transportation	Various	1,200 lbs.
Sault Ste. Marie	.....	1	Studebaker	General	City Engr.	.....
Minnesota:						
Mankato	.....	1	Ford	Repair	Water Works	.....
Red Wing	¼-ton	1	Gasoline	Hauling & Genl.	Water	.....
	.....	2	Ford	Utility	Pub. Wks. & Pol.	.....
St. Paul	5-ton	1	Gasoline	Construction	Pub. Works	.....
	2-ton	1	Gasoline	Sewer Repairs	Pub. Works	.....
	.....	7	Touring	Inspect. & Genl.	Pub. Works	.....
Mississippi:						
Vicksburg	3½-ton	1	Gasoline	Flushing	Street Cleaning	.....
New Hampshire:						
Rochester	2-ton	1	Gasoline	Hauling	Highways	Two trailers are used
	¾-ton	1	Gasoline	Hauling	Waterworks	
New Jersey:						
Asbury Park	3½-ton	1	Gasoline	Sprinkling	Public Works	.....
Passaic	.....	1	Ford	Conveyance	Street	.....

MOTOR VEHICLES OPERATED BY CITIES (CONTINUED).

City and State.	Capacity	No. of Ea.	Kind.	Work Used on.	Dept. Used By.	Genl. Inform't'n.
New York						
Binghamton	5-ton	1	Gasoline	Tractor	Garbage	Six trailers are
	5-ton	1	Gasoline	Flush. & Oiling	Street	used for various
	2-ton	1	Gasoline	Utility	Street	work
	1-ton	1	Gasoline	Utility	Sewer	
Elmira	1½-ton	1	Gasoline	General	Public Works	
	1-ton	1	Gasoline	General	Water Board	
	½-ton	1	Gasoline	General	Water Board	
Ithaca		1	Ford Truck	General	Public Works	
		1	Ford	Water	Water Works	
Kingston	3½-ton	1	Gasoline	Carting	Bd. of Pub. Wks.	
North Tonawanda		1	Gasoline	Sweeping	Public Works	Elgin Sweeper
Oneonta	½-ton	1	Gasoline	Emergency	Public Works	
Port Jervis		1	Gasoline		Street Dept.	
North Carolina						
Asheville	6-ton	1	Electric	Flushing	Street Cleaning	
	2-ton	1	Electric	Garbage	Street Cleaning	
	2-ton	1	Gasoline	Hauling	Street	
	1-ton	1	Gasoline	Water	Water	
		1	Touring	Transportation		Buick.
Charlotte	1-ton	2	Gasoline	Hauling Trash	Health	
	½-ton	1	Gasoline	Hauling	Health	
Durham		1	Touring	Transportation	Engineering	
Wilmington		3	Touring	Transportation	Various	
North Dakota:						
Grand Forks		2	Ford	Transportation	Various	One is truck.
Ohio:						
Dayton	5½-ton	2	Gasoline	Hauling	Streets	
	5½-ton	1	Gasoline	Hauling	Water Works	
	3-ton	2	Gasoline	Street Cleaning	Streets	City uses
	1-ton	2	Gasoline	Repairs & Supply	Streets	one trailer.
	1-ton	2	Gasoline	Water Extensions	Water	
	2-ton	1	Gasoline	Supplies & Parks	Welfare	
	2-ton	1	Gasoline	Work House	Welfare	
Pennsylvania:						
Altoona	2-ton	1	Gasoline	Street Cleaning	Street	
		1	Gasoline	Sweeping	Street	Elgin Sweeper.
		1	Touring	General	Street	
Franklin	2-ton	1	Gasoline	Hauling	Street	
		1	Ford Truck	Hauling	Street	
		1	Ford	General	Street	
Harrisburg	2-ton		Gasoline	Asphalt Repair	Streets	
Williamsport	1-ton	5	Gasoline	Hauling	Highway	
	1-ton	1	Gasoline	General	Highway	
Tennessee:						
Memphis		17	Touring	Supervision	Various	
Texas:						
Brownsville	1-ton	1	Gasoline	Trouble	Water & Light	
	1-ton	1	Gasoline	Patrol	Police	
	1-ton	1	Gasoline	Trash Wagon	Sanitary	
Virginia:						
Portsmouth		4	Touring	Patrol & Inspect.	Various	
Washington:						
Aberdeen	2-ton	1	Gasoline	Hauling Supplies	Water	
	1½-ton	1	Gasoline	Hauling Supplies	Water	
Tacoma	¾-ton	1	Gasoline	Line Construction	Light	Trailer on
	½-ton	1	Gasoline	Line Construction	Light	¾-ton.
West Virginia:						
Wheeling	¾-ton	1	Gasoline	Meters & Repairs	Water	
		3	Ford	General	Various	
Wisconsin:						
Ashland	1½-ton	1	Gasoline	Street	Street	1 Trailer.
Janesville	1-ton	3	Gasoline	Utility	Various	Ford Trucks.
		1			Police	
Milwaukee	2-ton	8	Gasoline	Hauling	Various	
	¼-ton	5	Gasoline	Hauling	Water & Street	
		16	Touring		Various	
		11	Roadsters		Various	
Wausau		3		Transportation	Various	
Wyoming:						
Cheyenne	2-ton		Gasoline	Hauling	Streets	

TABLE II—COSTS OF OPERATION.

City and State.	Time Covered	Average Load	Type of Machine	Cost Per Mile for— Tires	Gas or Cur'nt	R'prs	Total	Average Mileage Per Day	Remarks
California:									
Los Angeles	Jan., 1916, to	2.53 tons	Distillate	$0.0222	$0.0139	$0.0332	$0.0693	58	collecting garbage
	July, 1917	2.56 tons	Distillate	.0204	.0128	.0240	.0572	55	collecting garbage
Illinois:									
Chicago	1916	5 tons	Gas truck	$0.054	$0.043	$0.05	$0.147	38.4	
	1916	2 tons	Gas truck	.026	.028	.029	.083	43.5	
	1916	1½ tons	Gas truck	.021	.027	.014	.062	32.1	
	1916	1 ton	Gas truck	‡.05	.021	.015	.086	41.73	
	1916	800 lbs.	Gas truck	‡.016	.013	.01	.038	35.77	
Evanston	1 year	¾ ton	Gasoline	.02	.04	.026	....	25	garbage.
Massachusetts:									
Springfield	1 year	5 tons	Gas truck	....	....	....	.23	15	2.4 miles per gal.
	1 year	1 ton	Gas truck	....	....	....	.09	9	7.8 miles per gal.
Michigan:									
Detroit	1916	12 tons	Tractor§	....	....	....	.18	....	asphalt
	1916	12 tons	Tractor§	....	....	....	.184	....	garbage
	1916	1 ton	Gasoline	....	....	....	.08	....	engineering
	1916	5 tons	Gasoline	....	....	....	.081	....	sewer
	1916	2 tons	Gasoline	....	....	....	.06	....	sewer
	1916	6 tons	Gasoline	....	....	....	.14	....	paving
	1916	1½ tons	Gasoline	....	....	....	.10	....	sidewalk
New York:									
Binghamton	1 mo.	2 tons	Gas truck	....	....	....	.0875	....	621 mi. per mo.
	1 mo.	1 ton	Gas truck	....	....	....	.0525	....	591 mi. per mo.
	1 mo.	5 tons	Tractor	....	....	....	.09	....	695 mi. per mo.
Washington:									
Tacoma	4 mos.	1,000 lbs.	Gas truck	.0755	.0265	.0716	.1736	27.5	
	4 mos.	1,000 lbs.	Gas truck	.0234	.0250	.0255	.0739	21.9	
Wisconsin:									
†Milwaukee	Jan.-May		Touring	.011	.023	.010	.044	34.9	Ave. 5 cars.
	Jan.-May		Fords	.013	.024	.012	.049	27.5	Ave. 16 cars.
	Jan.-May	1½ ton	Gas truck	....	.065	.002	.067	21.5	Ave. 3 cars.
	Jan.-May	1 & 2 ton	Gas truck	.053	.053	.038	.144	17.4	Ave. 5 cars.
	Jan.-May		Touring	.028	.058	.080	.166	31.6	Ave. *5 cars.
	Jan.-May		Miscel'n's.	.029	.042	.054	.125	18.0	Ave. 5 cars.

*Two of these cars were overhauled, thus adding to the repair cost. †Does not include oil or miscellaneous items in cost record. ‡Cost for pneumatic tires. §With trailer.

TABLE III—MISCELLANEOUS INFORMATION.

City and State	Does City Maintain: municipal garage?	Does City Maintain: municipal repair shop?	Are Records Kept of: mileage of each truck?	Are Records Kept of: gasoline and oil used?	Are Records Kept of: tires, repairs and maintenance?	Are motor vehicles a satisfactory substitute for horses?	Is gasoline or electric preferred?	Do trucks damage roads?	Do weather or road conditions require trucks to be laid up at times?	Are trucks used on unimproved as well as improved roads?
Arkansas:										
Little Rock	No	Yes	No	Yes	Yes	Yes	Gasoline	No	No	Yes
California:										
Los Angeles	Yes	Yes	Yes	Yes	Yes	Yes	Gasoline	No	Yes	Yes
Pomona	No	No	..	..	..	..	.....	..	..	..
Redlands	No	No	No	No	No	..	.....	..	..	..
Colorado:										
Grand Junction	No	Yes	Yes	..	Yes	Yes	Gasoline	No	No	Yes
Connecticut:										
Hartford	No	No	Yes	Yes	Yes	..	.....	..	..	..
Middletown	No	No	No	..	No	Yes	Gasoline	No	No	Yes
Stamford	No	No	No	No	No	Yes	Gasoline	Yes	..	..
Illinois:										
Chicago	Yes	Yes	Yes	Yes	Yes	Yes	Gasoline	No	Seldom	Yes
Cicero	No	No	No	..	..	..	.....	..	..	..
Decatur	No	Yes	No	Yes	Yes	Yes	Gasoline	Yes	Off of paved streets	Yes
Evanston	No	No	Yes	Yes	Yes	Yes	....	Yes	No	Yes
Peoria	Yes	No	..	Yes	Yes	Yes	Gasoline	No	..	Yes
Urbana	No	No	No	Yes	Yes	Yes	Gasoline	No	No	Yes
Indiana:										
Goshen	..	..	..	..	..	Yes	Gasoline	No	No	Yes
Peru	No	No	No	..	..	Yes	Gasoline	No	Never	Yes
South Bend	Yes*	No	No	No	No	Yes	Gasoline	No	No	Yes
Terre Haute	No	Part	No	No	No	Yes	Gasoline	No	No	Nearly
Vincennes	No	No	No	No	..	..	.....	..	..	..
Iowa:										
Burlington	..	..	..	..	..	Yes	Gasoline	No	No	..
Kentucky:										
Frankfort	No	No	..	Yes	Yes	Yes	Gasoline	No	No	Yes
Massachusetts:										
Norwood	..	Yes	Yes	Yes	Yes	Yes	.....	..	..	..
Springfield	No	Yes	Yes	Yes	Yes	Yes	Gasoline	No	No	Yes
Winthrop	..	..	..	..	..	Yes	Gasoline	No	No	Yes
Michigan:										
Cadillac	No	No	..	Yes	Yes	..	.....	..	..	..
Detroit	Yes	Yes	Yes	Yes	Yes	Yes	Gasoline	No	In Asphalt Department	Yes
Flint	Yes	Yes	No	No	No	Yes	Gasoline	No	Yes	Impr.
Ironwood	No	No	No	No	No	Yes*	Gasoline	Yes	Yes	Yes
Kalamazoo	..	..	..	..	..	Yes	.....	..	No	..
Manistee	No	No	No	No	No	Yes	.....	No	..	Yes
Marquette	No	No	Yes	Yes	Yes	Yes	Gasoline	Slightly	In winter	Yes
Minnesota:										
Mankato	..	..	..	..	..	Yes	Gasoline	No	In winter	Yes
Red Wing	No	No	No	..	..	Yes	Gasoline	No	Not often	Yes
St. Paul	Yes	Yes	Yes	Yes	Yes	Yes	Gasoline	Yes	No	Yes
Mississippi:										
Vicksburg	No	No	No	Yes	Yes	Yes	Gasoline	No	No	No
New Hampshire:										
Rochester	No	No	No	Yes	No	Yes	Gasoline	No	In deep snow	Yes
New Jersey:										
Passaic	No	Yes*	No	No	..	..	.....	..	..	..
New York:										
Binghamton	Yes	Yes	Yes	Yes	Yes	Yes	Gasoline	Yes	No	Yes
Elmira	No	Yes	..	Yes	Yes	Yes	Gasoline	No	No	Yes
Geneva	No	No	No	No	No	Yes	.....	No	No	Yes
Ithaca	Yes	Yes	Yes	Yes	Yes	Yes	Gasoline	No	No	Yes
Kingston	..	..	No	No	No	Yes	.....	No	No	Yes
Little Falls	No	No	No	No	No	Yes	Gasoline	No	Yes	Yes
Oneonta	No	No	No	No	No	..	.....	..	..	..
Port Jervis	No	No	No	Yes	Yes	Yes	Gasoline	Yes	Yes	Yes
North Carolina:										
Asheville	No	No	No	Yes	No	Yes	Gasoline	No	No	Yes
Charlotte	No	Yes	No	Yes	Yes	Yes	Gasoline	No	No	Yes
Durham	No	No	No	Yes	Yes	Yes	Gasoline	Some	..	Yes
North Dakota:										
Grand Forks	No	No	No	No	No	Yes	Gasoline	No	No	Yes
Ohio:										
Dayton	Yes	Yes	No	Yes	Yes	Yes	Gasoline	Yes	Yes	Yes
Pennsylvania:										
Altoona	Yes	No	Part	No	No	Yes	Gasoline	No	No	Yes
Franklin	Yes	No	No	Yes	Yes	Yes	.....	No	Not often	Yes
Harrisburg	..	..	No	No	No	Yes	Gasoline	No	No	Yes
Williamsport	Yes	No	Yes	Yes	Yes	Yes	Gasoline	Not much	Seldom	Yes
Tennessee:										
Memphis	..	Yes	No	Yes	Yes	Yes	.....	Don't know	No	Yes
Texas:										
Brownsville	No	Yes	No	Yes	Yes	Yes	Gasoline	No	No	Yes
Temple	No	Yes	..	..	..	..	.....	..	..	..
Virginia:										
Portsmouth	No	No	..	Yes	Yes	Yes	Gasoline	No	..	..
Washington:										
Aberdeen	No	Part	No	No	Yes	Yes	Gasoline	Slightly	No	Yes
Tacoma	Yes	Yes	Yes	Yes	Yes	Yes	.....		Not much	Yes
West Virginia:										
Wheeling	Yes	No	No	No	..	Yes	Gasoline	Yes	No	Yes
Wisconsin:										
Ashland	No	Yes	No	Yes	Yes	Yes	Gasoline	..	No	Yes
Janesville	No	No	Yes	Yes	Yes	..	.....	..	..	..
Madison	No	No	No	No	No	Yes	Have gas	No	No	Mostly on paved streets
Milwaukee	Yes	Yes	Yes	Yes	Yes	Yes	.....	..	No	Yes
Wausau	No	No	No	Yes	Yes	Yes	Gasoline	Not much	No	Yes
Wyoming:										
Cheyenne	No	..	..	Yes	..	Yes	Gasoline	Yes	Yes	Yes

*For some of the cars.

INDUSTRIAL RAILWAYS

Comparison as to Efficiency and Cost with Motor Trucks, Tractors and Teams—Use in Highway Work in Two States.

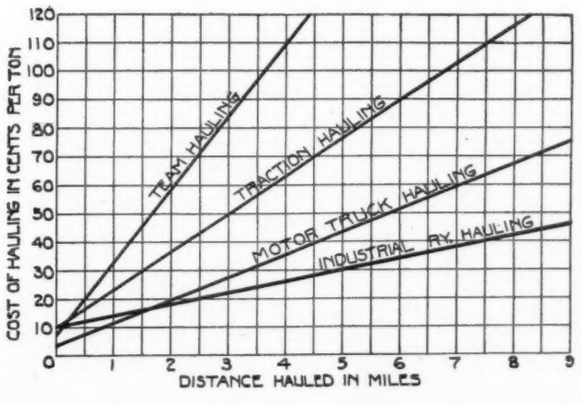
Two or three articles in this week's issue describe the use of industrial railways on highway construction work, and in the following paragraphs a few other instances of its use will be described briefly.

First, however, reference will be made to a paper prepared by Prof. T. R. Agg, dealing with the selection of road building machinery. Prof. Agg states that the selection of transportation equipment should be governed by price, rate of depreciation, cost of operation and speed of operation under various weather and other conditions. Under normal conditions the rates of travel may be taken as 2½ miles per hour for teams, 8 to 10 for motor trucks, 3 miles for tractors and 10 miles for industrial railways. The capacities may be assumed as 2 tons for teams, 5 tons for motors, 15 tons for tractors and 20 tons for industrial railways. Costs of operation, including interest, depreciation, maintenance, supplies and labor will perhaps average 59c. per hour for teams, $2.00 for tractors, $3.00 for motor trucks and $4.00 per hour for a train of 10 cars and 1 locomotive. The chart shows that on hauls from 1 mile up, the industrial railway has the advantage, particularly in costs; also that as the haul increases, the industrial railway's economy of operation maintains a big ratio of increase.

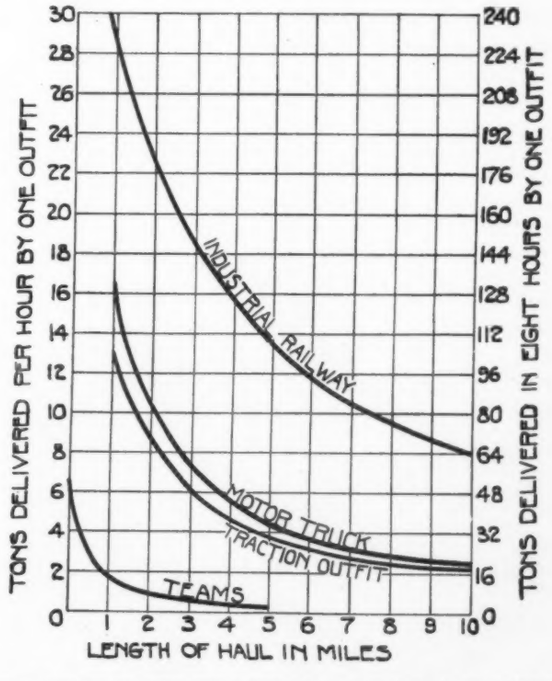
This point is illustrated by some figures given by Fred Tarrent, division engineer of the Illinois Highway Department. In the case cited by him, 25,473 cubic yards of stone were moved by industrial railway over an average haul of 3.17 miles in less than 5 months, calculated from the time the equipment was received at the point of freight delivery until it was placed back on the freight cars. The cost was 14.8c. per ton-mile, including rent, freight charges both ways, and putting the equipment in first class shape before it was returned. If the equipment had been owned by the contractor the cost would have been about 11c. after allowing 20 per cent for depreciation and upkeep. The cost of team haul on this job would have been 28c. or 30c. per ton-mile, but as a matter of fact it would have been impossible to have secured enough teams to complete the work in double the time. The equipment in this case consisted of two 20 h. p. locomotives, 6 miles of portable track and 60 side-dump, V-body cars. Four men laid the 15-foot sections of the track, about 2,000 feet being laid a day. One man was employed to look after the condition of the track and correct any low spots or loose connections, as a good track assures better speed and prevents derailments. Upon the completion of this job, the central loading station and the entire railway equipment was transferred 6 miles overland to a new loading station in 6 days, by picking up the track in the rear, hauling it by the cars and placing it ahead of the forward end of the track. The cost of this transportation was $329.

In this job each train was manned by an engineer and two brakemen, the brakeman on the front end helping with the firing and other work on the engine. These two brakemen dumped the cars in from 20 to 30 minutes. Loading was done in from 10 to 20 minutes by a gasoline belt conveyor from a pit into which the stone was dumped from the railroad cars, two men attending to the loading. Mr. Tarrent named as the advantages of this equipment the practical independence of the labor situation and reduction of men on the pay roll; ability to haul more cheaply and quickly and under almost any weather conditions; no expense for resurfacing sub-grade as is the case when wagons or tractors are used, as these leave the road more or less cut up; light weight of the outfit, making it possible to cross light bridges; and small amount of space required for operation.

In two concrete jobs in Michigan, a 7-ton, 3-h.p. locomotive and 60,000-pound double-side-dump V-body cars, and five 16-foot freight cars, together with the necessary portable track (all Koppel equipment), handled 27,812 tons of pebbles, sand and cement, over an average haul of 2.75 miles at a cost of 10.5c. per ton-mile. This includes office charges and proper overhead, but takes no account of the hauling of armor plates, joint filler, empty cement sacks and the transportation of men from one point to another; it also includes a depreciation charge for an entire year, the plant being used for 4 months on this work. The road commissioners who used this outfit stated in their report: "As compared with other methods of haul where conditions are similar to these two jobs, we have saved approximately the cost



COMPARISON OF COSTS OF HAULING BY DIFFERENT CONVEYANCES.



RELATION BETWEEN LENGTH OF HAUL AND WORK DONE.

of the entire equipment." In operating this outfit there was employed an operator for a clam shell bucket which loaded the dump cars from the railroad cars or stock piles, 4 laborers, 1 teamster and team to haul the cars to a siding where trains of from 30 to 42 cars were made up, and an engineer and brakeman to operate the train.

For short hauls, electric storage battery trucks can be obtained with special bodies which will carry up to 3,000 pounds over any going where the wheels can get a grip and the road clearance is 5½ inches or more. These trucks and tractors can be furnished with flanged wheels to carry loads and pull trailers with special bodies on industrial railway systems in sand pits, quarries, supply yards, etc. The heavier tractor types have a capacity of 15,000 pounds and will negotiate grades up to 20 per cent. These electromobiles will displace from 3 to 10 men, depending on the nature of the work.

MOTOR VEHICLES IN SPOKANE CITY WORK

Fifty-four in Service—Thirteen Sprinkler Trucks Built by City Fire Department—Use Made of the Several Vehicles.

By HENRY F. NELTHORPE.

The city of Spokane, Washington, began the accumulating of motor vehicles in 1911 with a view to securing greater efficiency in the street department. Several autos also were purchased for engineers and superintendents. Following this it was decided to build a garage and repair shop in which two men were employed. Since that time the number of motor vehicles has been increased to 54 and the garage has been enlarged to three times its original size and employs eight men and has again become too small to house all of the machines. The 54 motor vehicles owned by the city are as follows: Three trailers, six 1-ton trucks, three 1½-ton trucks, two 2-ton trucks, three 3-ton trucks, thirteen 5-ton trucks, one 7-ton truck, nineteen Ford cars (some of which have been converted into light trucks), two Dodge cars, one Oldsmobile, and two Yuba tractors.

In 1914 the city undertook to build thirteen 5-ton trucks, using for this purpose the members of the fire department, who worked in their leisure time. These cost the city between $2,000 and $2,100 each, besides the labor. One 7-ton truck is now under construction. These trucks were built for street sprinkling purposes to take the place of 40 horse-drawn carts so used. The accompanying table gives the number and capacity of each size and kind of car, the department by which it is used and the kind of work which it does. The photograph, which is taken outside of the city garage, shows most but not all of the city's motor vehicles.

Each motor sprinkler carries a tank of 1,200 gallons, instead of the 550 gallons which the horse-drawn tanks hold, and in general the cost per mile is about one-quarter as great. In some instances, however, the city continues to use horse-drawn sprinklers, mostly on hills. The average cost per vehicle is about as follows:

	Motor	Horse
Gallons of water used in a day.....	67,000	18,103
Miles traversed or sprinkled.....	30	6
Cost to operate and maintain.....	$7.50	$6.00
Cost per mile.....	.25	1.00

The cost of operation is higher than in some cities, but this is largely accounted for by the fact that the city pays $6.00 a day for a man and team, $4.00 per day for truck drivers, 75c. an hour for labor at the garage, 23c. a gallon for gasoline, and 50c. a gallon for lubricants.

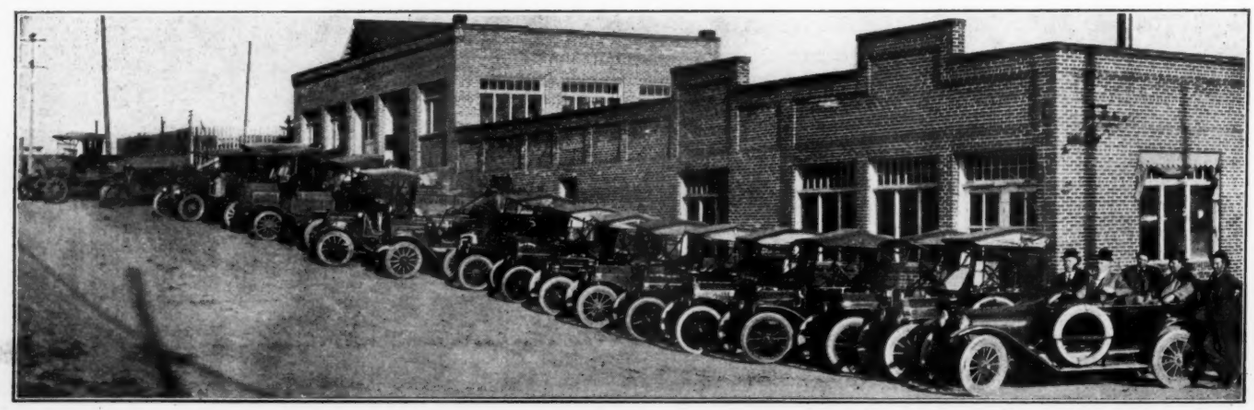
An air-pressure pump has been installed on several of the motor-driven sprinklers and an attachment so that when the sprinkler reaches a wide street, some of which are 75 and 100 feet wide, the car can be made to sprinkle the entire width at one trip. Paved streets are not sprinkled.

The street cleaning division uses motor air-pressure flushers in the business and central districts and horse-drawn air-pressure flushers in the outlying districts. It is found that the same amount of work can be accomplished by the motor flushers at less cost than by the horse-drawn, the cost of flushing per thousand square yards being 25c. by motor and 28c. by horse.

Previous to 1916 the streets were re-graded with horse-drawn graders, steam rollers and trucks, but since that time the city has purchased two tractors and uses them to draw the graders and finds that it can accomplish double the amount of work. In 1916 it re-graded 261 miles of streets for $4,746.15, or $18.18 per mile. In this case also the prices paid were higher than in many cities, the foreman being paid $110 a month, tractor driver $5.50 a day and laborers $3.50 for an 8-hour day. One advantage of the tractor over horse and roller is that it is not necessary to unhitch the grader from the tractor to go to the end of the street to turn around, for the tractor can turn in its own length. Each tractor is provided with a trailer which carries sufficient oil and supplies for the tractor.

In winter the tanks are removed from the trucks and replaced with wagon boxes for hauling snow, when this has to be carried some distance. The tractor also draws graders to clean gutters, although where there are large sewers a horse drawing a large scoop is provided by which the snow is hauled to a manhole.

A great advantage is experienced by the use of autos



by superintendents, inspectors and emergency men, for installing water meters and making repairs, there being no comparison between the slow moving horse and the light auto or converted truck in respect to the amount of work accomplished, ground covered and dispatch with which one can reach the desired location. This auto service costs an average of about 4c. a mile. In addition to these, four motorcycles are used in the water division for inspectors and men to turn water on and off and to read meters. The cost of these motorcycles is about 1c. per mile.

By the use of motor trucks in the sewer division, the amount of work done by the division has been tripled. One is used to haul hose and equipment for flushing and cleaning sewers and catch basins, the other to haul the dirt from the catch basin to the dump in large buckets. As a majority of the catch basins are in the outlying districts, and long hauls are required, the advantage of the truck over the slow moving horse is very great.

The superintendent of the incinerator has five motor trucks for collecting ashes and debris from houses and expects to purchase more, from which it would appear that he considers the motor vehicle preferable to the horse-drawn for this work also, although some cities have come to the conclusion that this is not the case.

The records of the garage are kept in considerable detail, an important item in which is the garage work order sheet. This form is made out in triplicate, the total for each month being made out for each machine. At the top of this order are spaces for recording the make of machine and where purchased; the month and year to which the record applies; the speedometer reading at the end of the month, at the beginning of the month, and the total mileage for the month. One line is provided for each day of the month, and the vertical columns are headed as follows: hours of labor; gallons of gasoline; gallons of distillate; pints of oil; grease, tools, waste, polish; repair parts, nuts, screws, etc.; accessories. Each of the last three columns is divided into two, one containing the number of the request for the material and the other the cost or value. The last two columns provide for entering the number of new tires put on and their value, while the make, size and the mileage of the old tire taken off are recorded also. At the foot of the sheet are given the total cost for the month and the cost per mile.

LABOR-SAVING DEVICES ON CONCRETE PAVING.

The P. F. Connelly Paving Company, of Little Rock, Arkansas, uses a number of labor saving devices, which Mr. Connelly lists as follows, in a brief note to Municipal Journal:

First is a Kinney penetration machine for distributing

MOTOR VEHICLES—CITY OF SPOKANE, WASHINGTON.

No.	Capacity.	Department Used By.	Kind of Work Used For.
1	3-ton	Street	Hauling debris off street after cleaners.
2	3 "	"	Hauling debris off street after cleaners and sprinkling.
3 to 11	5 "	"	Sprinkling, hauling snow, etc.
12 to 15	5 "	"	Street flushers.
16	1 "	"	Utility truck, hauling lumber for crosswalks and bridge repairs, tools, etc.
17	1 "	"	Hauling debris off street after cleaners.
18	7 "	"	Not completed, but intend to use it as sprinkler and utility truck.
19	1 "	"	Hauling debris off streets and utility truck.
21	2-pass. auto	"	Street superintendent.
22	2 " "	"	Emergency auto, making inspection on streets at day time, placing red lights at night.
23	2 " "	Garage	Shop car at garage.
24	2 " "	Sewer	Sewer inspector on installation of sewers.
25	2 " "	Engineering	City engineer.
26	2 " "	Asphalt	Paving superintendent.
27	1½-ton truck	"	Hauling materials from plant to repair streets.
28	1½ " "	Sewer	Hauling hose and equipment to flush out catch basins and sewers.
29	2 " "	"	Hauling debris from catch basins to dump.
30	3¼ " delivery	Water	Water engineer to find and repair leaks in water mains.
31 to 34	1-pass. motorcycle	"	Water meter readers, inspectors, and emergencies.
35 & 36	2 " auto	"	Installing water meters.
	2 " "	"	Meter repairs.
37	2 " "	"	General repairs.
38	1-ton truck	"	General repairs.
39	3 " "	"	Water main construction and hauling material.
40	5-pass. auto	"	Water superintendent.
41	5 " "	Health	Health quarantine officer.
42	5 " "	"	Sanitary inspector.
44	5 " "	"	Dairy and milk inspector.
45	2 " "	"	City health officer (Dr. Anderson's private car, City maintains same).
46	5 " "	"	Contagious hospital, carrying patients to and from hospital.
47	2 " "	Weights and Measures	Inspector of weights and measures.
48	5 " "	Legal	Claim agent.
49	2 " "	Crematory	Crematory superintendent.
50	2 " " (box)	"	Hauling small dead animals off street.
51	1½-ton truck	"	Hauling ashes and debris.
52	3 " "	"	" " " "
53 & 55	1 " "	"	" " " "
54	2 " "	"	" " " "

The photographs on this and the opposite page show 27 of the 54 motor vehicles used by the city of Spokane, lined up on two sides of the municipal garage. Those on this page are 5-ton sprinkling trucks.

asphalt in road work. Next, an Archer concrete mixer which it requires only one man to operate, this man feeding the cement, applying the water, receiving the material, dumping the charge and moving the machine. A Spaulding rock spreader is next in order; following this is a Rapid" rock loader for loading stone from cars to wagons. Next I would place a Stroud & Co. grader for loading dirt from street to wagons. Roughin's concrete cut-off saves four men on concrete pavement work. P. F. Connelly's adjustable finishing long-handled trowel and jointer also saves four men. Last but not least, the use of No. 5 shovels instead of No. 2 saves both labor and money.

COMPRESSED AIR IN STREET EXCAVATING AND TAMPING

Drills and Picks Used in Removing Rock, Concrete and Macadam—Excavating and Tamping Trenches—Some Performance Figures.

By H. L. HICKS.

In replacing hand labor with power for street work there are ordinarily available steam power, electric power and internal combustion engines. There are some classes of work in which the appliances are so small that the power must be conveyed from a central plant, and for this purpose steam or compressed air may be conveyed by hose or electric current by wire. The use of compressed air has several advantages over steam, one being the avoidance of the considerable loss of heat and energy through long lengths of steam hose.

The more common appliances operated by pneumatic machinery include drills, picks, trench tampers, riveting and calking hammers. For furnishing the compressed air there are on the market light-weight portable air compressors and motors combined, the motor being either steam or internal combustion engine or electric motor. The internal combustion engine possesses the advantage over steam of being moved readily as the work progresses, thus eliminating the expense of extended pipe lines from semi-permanently installed steam plants. The latter also needs shelter from the weather, while the portable unit is generally provided with a roof and curtained from storms. The illustration shows a gasoline driven compressor in which a 2-cylinder vertical compressor is belt-driven from a 4-cylinder gasoline motor. Belt drive possesses the advantage of absorbing the shock and jar of starting and stopping. In the machine illustrated a cone clutch permits releasing the load when starting.

Electric motor-driven compressors also are largely of the belted type and are well suited for street work where electric current is available; but because of their more universal adaptability the gasoline-driven types are more generally employed.

A compressor of the type illustrated was used by a New York city contractor for supplying air to two jackhammer drills in drilling conduit holes 2 inches in diameter in concrete bridge abutments to an average depth of 2½ feet. The record for one week was as follows:

	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.
Hours worked.....	9	9	8	9	7	9
Gasoline consumed (gals.)	20	20	18	20	16	20
Cost per gallon....	$0.23	$0.23	$0.23	$0.23	$0.23	$0.23
Lubricating oil used (quarts)	2	4	2	2	2	4
Cost per quart.....	$0.10	$0.10	$0.10	$0.10	$0.10	$0.10
Drill hole footage..	300	290	275	295	250	300

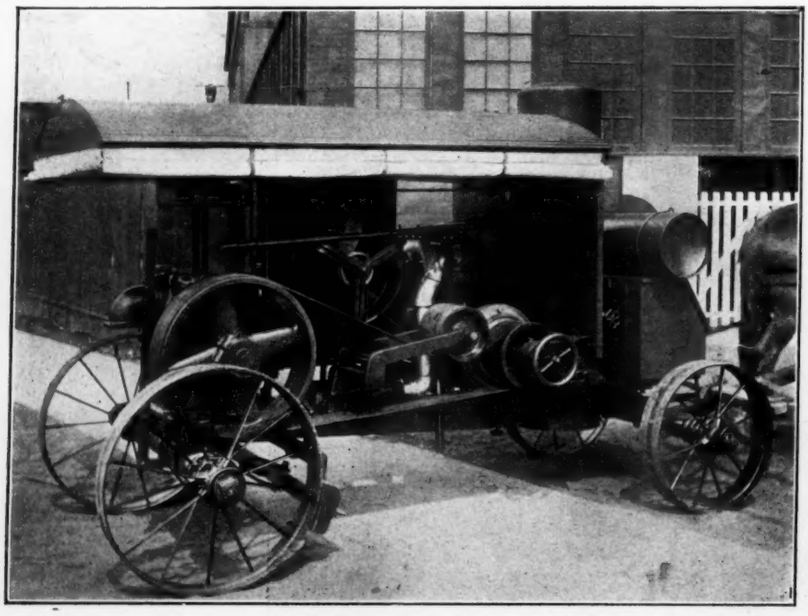
Labor costs: 1 driller, $2.50 per day; 1 driller, $3 per day; 1 compressor operator, $4 per day.

From this it can be figured that the total cost for compressor operation and workmen was 4.9 cents per foot of hole.

The jackhammer drill referred to is a self-rotating hand-hammer drill extensively used in road construction, street repair and quarry work, for drilling rock and concrete pavements, picking bituminous road surfacing, digging trenches and numerous other jobs. By fitting them to a light feed shell mounting they can be used for driving a small sewer tunnel.

A contractor on a Virginia road 13 miles in length used an outfit of this kind for drilling out boulders and succeeded in making nearly a foot a minute in limestone, making 300 to 400 feet of drill hole in a 10-hour day at a cost of less than 5 cents a foot. In describing this work he said: "I am sure we put down many a 3 or 4-ft. hole before the average laborer would get his hammer and steel and find a place to sit down and hold the steel to be driven by hand."

(*Continued on page* 110)



GASOLINE-DRIVEN PORTABLE COMPRESSOR—INGERSOLL-RAND.

AIR-OPERATED JACKHAMMER AT WORK IN TRENCH.

Municipal Journal

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SOLVING THE LABOR PROBLEM.

Several times during the past two months we have expressed the opinion that the problems of shortage and cost of labor could be solved successfully by the more extensive use of machinery and mechanical appliances. In this issue we have presented descriptions of the actual use of a number of such, from complete industrial railway equipments to pneumatic tampers, picks and chipping hammers. The use of trucks, tractors, scrapers, caterpillars, trenching machines, road rollers, rock spreaders and other contrivances in ways not commonly employed, are described by contractors and engineers who have tried them out. Others have found loading bins, loading elevators, etc., great savers of time and money. Practically all of these descriptions are right from the jobs where they are now being used; and where it was possible to obtain cost figures, we have given them.

In some of the work described, the saving has been effected by special adaptation of appliances to the eliminating of labor. For example, one contractor divides the body of his industrial railway car so that the stone and sand for a concrete pavement are placed in the desired proportion in each car, and the car is dumped directly into the mixer, thus eliminating entirely the wheelbarrow gang. A highway contractor uses a road scraper for grading the subgrade and spreading the stone, saving three-fourths the cost of hand labor on such work.

Syracuse, N. Y., finds that a trenching machine reduces the cost and expedites the work of digging water works trenches and uses its machine for practically all of this work. Erie, Pa., by use of a flushing machine releases twelve laborers and four teams, formerly employed in this work, for use in street construction where more labor was needed.

These few illustrations, among the many that can be found all over the country (those given are distributed from Connecticut to California and from Michigan to Texas), confirm our contention that the scarcity of labor need not cause a material cutting down of the amount of work done, and that it is possible also to perform it with little, if any, increase in cost.

PREPAREDNESS AND ECONOMY.

Appleton County, Wisconsin, secured contracts this year for road work at a cheaper rate per mile and per square yard than it paid for last year's work, according to a statement made by Walter J. Driscoll, the secretary of the County State Road and Bridge Commission. This result it secured by two changes in its procedure. One of these was the purchasing by the county of the material to be used in all this year's contracts. As the county bought in large quantities, it was able to obtain lower prices than could any one contractor buying for his contract only. The other reason for low cost was that this purchasing was done and the contracts let during the winter or early spring when not only were prices lower, but the material could be shipped before the rush of work produced car shortage and while there were plenty of vehicles available, at low rates prior to the beginning of the planting season, for distributing the materials along the line of the proposed work. The early letting of the contract also enabled the contractor to make all his preparations beforehand, engage his foremen, and possibly the laborers also, get his equipment on the ground at his leisure and be prepared to take advantage of the most favorable opportunities presented by the weather for beginning and prosecuting the work.

The county also assisted the work by maintaining an inspector at the gravel plant, by which means they were enabled to accept the material before it was shipped rather than waiting to pass upon it until it had reached the site of the work. Where material is not inspected until it has been delivered, the rejection of it often causes long delays which are more or less costly to the contractor because of the interruption of the work while waiting for shipment of proper material to take the place of that condemned.

In another instance, described elsewhere in this issue, the contractor purchased his own materials, but the contract was awarded in the fall and advantage was taken of the opportunity for delivering material, along the side of the road which was to be improved, by sleighs during the winter and by other vehicles when there was little demand for them, and in this way the contractor was enabled to keep down to a comparatively low figure this item of delivery of material, which sometimes amounts to a considerable percentage of the total cost of the work. By having all of the road metal on hand before work began, also, he was assured that there would be no delay in the receiving of materials, which delays invariably add to the cost of the work, because men either must be worked to less advantage because of such delay, or must be laid off for a few days, with the result that many of them may not return when work is resumed and time and expense may be incurred in filling the gang again to the desired size.

These and other experiences indicate the advantage of preparing well beforehand for road work, and indeed for any work of considerable size. Where it is possible to do so, there are very pronounced advantages in letting contracts in the fall for the work of the coming year. In

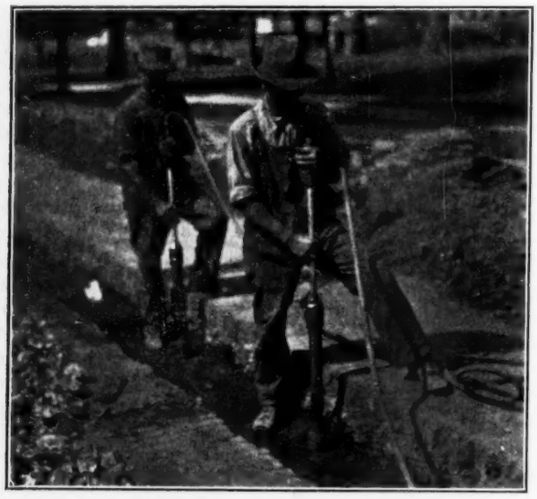
addition to those already noted, contractors who are about completing work in the vicinity will frequently bid somewhat lower because they will not then have to remove their plant from the vicinity to their home town and return it to the same locality in the spring, but can ordinarily store it more cheaply in a barn or other building in the neighborhood and avoid the expense of this double freighting.

COMPRESSED AIR IN STREET EXCAVATING.

(*Continued from page* 108)

A similar compressor operating two jackhammers was used in digging sewer trenches near Tuckahoe, N. Y., and each drill easily put down 100 feet of hole per day. The operating cost was $17.80 per day, which included gasoline, oil, forge coal, and the wages of an operator, two drill runners, a blacksmith and a helper. This makes the cost about 9 cents per foot of drill hole. In another trench-digging job in Greeneville, Tenn., two drills of this kind were operated by a portable compressor run by electric motor. Electric current cost 2 cents per kilowatt, or about $1.25 a day, and if we assume the same labor cost and drilling speed as above the cost per foot of hole would be about 8 cents.

There are some cases in which it seems to be economical to dispense with the compressor and use the steam direct. For instance, where a steam shovel is used, steam can be brought direct from the boiler through comparatively short lengths of hose and be used to operate the drills directly at possibly less cost than if a compressor were used. The drills referred to above can be operated directly by steam in this way as well as by compressed air.



PNEUMATIC TAMPERS AT WORK.

Not only in excavating trenches, but in back-filling them also the air compressor can be used to advantage. Pneumatic rammers for trench tamping are said to give results superior to hand work, as the pneumatic rammer strikes 600 blows per minute and with more than twice the pressure exerted by a man working by hand, who can deliver only from 30 to 50 blows per minute. The pneumatic rammer is a reciprocating machine in which the extended piston rod carries a suitable butt for compacting the earth. The cost of pneumatic tamping under average conditions has been found to be about 7 cents per cubic yard, while hand tamping frequently costs two or three times as much. The same amount of tamping can be done with about one-half the number of men when using the pneumatic tamper.

USE OF ROAD SCRAPERS.

Some saving of labor, and at times a very considerable saving on road construction work, could be effected by the wider use of a road grader or scraper, according to John H. Gordon, a contractor of Albany, N. Y. Said he in a recent letter to Municipal Journal: "Few grade foremen on our work understand the use of these machines. At times they use them for trimming shoulders, but rarely otherwise. The town superintendents throughout the state are more familiar with their use and do much grading with the heavier type machine drawn by a road roller or a traction engine. Last season I hired a man who had been working on the county roads, and he was able to do effective work with such a machine at one-quarter the cost of hand labor.

"The Fresno also is a useful tool when properly handled. It is rather hard on horses, but with two teams it could do much of the work of fine grading that is very generally done by hand.

"Many contractors still mix their concrete for culverts by hand, but a small concrete mixer will save half the labor on such work."

THE CATERPILLAR IN ROAD WORK.

Caterpillar tractors were used to a considerable extent for hauling material along the Los Angeles aqueduct where there were no roads, or only poorly graded ones; and the same principle has been employed for the running gear for certain trench diggers and for other machinery used on uneven ground. A further use has been developed in road construction work. For instance, a gasoline caterpillar tractor has been used for several years by the city of Pontiac, Mich., which hired it from a contractor of that city, and finally last year the city purchased one. It uses it in grading streets as well as hauling gravel and crushed rock for the surfacing of main roads extending out of that city. George Brown, commissioner of streets, gives the following particulars of the operation of this tractor on one piece of work, the figures being averages: Four trips a day hauling 13½ yards 2 miles each trip, or 54 yards a day. 35 gallons of gasoline used at 17c., 6 quarts of oil at 10c., and 4 quarts of oil at 6¼c., giving a total cost for materials of $6.80. An operator at $4.00 ran the machine, making a total cost per day of $10.80. This gives a cost per yard mile of 10c., no overhead charges included.

CATERPILLAR DRAWING ELEVATING GRADER.

A similar machine is used by the city of Montgomery, Ala., and they state that it is doing the work of from 14 to 16 teams. The operating cost, including the operator and allowing for depreciation and upkeep, is approximately $20 per day. In Kansas City, Mo., contractor H. H. Hanenkratt uses the same appliance for pulling an elevating grader, instead of using a number of teams of horses or a road roller.

The WEEK'S NEWS

State Road News in Maryland and Idaho—Housing and Health in Milwaukee and Rochester—Hetch-Hetchy Progresses —New York to Celebrate Catskill Water—New Jersey Cities Fight Gas Standard Reduction—Indiana Cities Oppose Surcharge for Electricity—Atlanta's Conflagration Explained by the Underwriters—Fires in Harrison, Ida., and Rochester, N. Y.—Flood Protection Upheld in Court—Progress on New York City's Zoning Law—Race Segregation in McAlester.

ROADS AND PAVEMENTS

City Wins Assessment Case.

York, Pa.—The right of the city of York to assess the cost of street paving upon abutting owners was upheld by the state superior court, when decisions were rendered affirming the rulings of judge Ross in the test cases. The litigation was the result of a concerted action by several hundred property owners who resisted the collection of the street paving assessment upon South Queen, South Pine, East King, West College avenue, West Philadelphia, East Princess and several other streets. That they are not yet prepared to accept the action of the superior court, and that they are advising property owners against whom the city has filed liens not to make payment until a final decision has been reached, was the statement made by attorneys for property owners. It is possible that an appeal to the supreme court may be made. The paving suits will establish a precedent for third class cities in the state. Counsel for the property owners declare that it is perfectly clear that the opinions can only affect owners of property which abuts on streets which have never been improved before the present paving. In 1915 the city filed liens against property owners on North Hawthorne, East Princess, and other streets for the payment of paving assessment. Petitions were filed to strike off the liens, the rule was discharged, and the cases brought to trial in the York county court. Abutting property owners maintained that with the exception of Hawthorne street, the improvements made in 1914 was not original paving but a repaving and therefore not liable to assessment. Judge Ross decided that the counsel for the property owners did not present sufficient evidence in support of their contention to allow the case to go to the jury, and gave binding instructions in favor of the city. The property owners then appealed.

Road Commissioner Objects to Reciprocity.

Baltimore, Md.—Frank H. Zouck, chairman of the state roads commission, has addressed a letter to the Maryland senators and representatives protesting against a pending bill which would establish reciprocity between Maryland and the District of Columbia in the issue of automobile licenses. This would mean that all automobile owners in the District could use the improved roads in Maryland free of charge, while Maryland owners would have the same privilege in the District. This would mean an annual loss by Maryland of over $90,000, and as Mr. Zouck says, would be an entering wedge to other reductions. In his letter Mr. Zouck says in part: "Last year we received from Washington licenses $86,988.76 for pneumatic-tire vehicles and $3,088.50 for solid-tire vehicles or trucks, making a total of $90,077.26. We shall expend $100,000 this year in maintaining the roads in the two counties bordering on the District of Columbia and the Washington Boulevard. The money received from the automobile licenses is the only money which we receive to maintain our state road system, the legislature of 1916 having removed the one cent state tax, which was formerly applied to the maintenance of state roads. If we are to be deprived of the revenue collected from the Washington cars, it will seriously embarrass this commission. When the one-cent state tax was removed it was thought that the revenue from the automobile licenses would amount to sufficient to take care of our maintenance, but we find that we are running behind at the rate of about $100,000 or more per year, and if the Adamson Law goes into effect it will increase our deficit another $100,000, making a total of $200,000 or more per annum. In view of the increased cost of material, labor, etc., and the increased amount of traffic which will pass over our roads because of the war it will be utterly impossible for us to maintain our roads as we have in the past. Maryland has reciprocity with every state and territory within the United States, which extends to our state the same privilege and the use of their many miles of roads, but we think it is unfair to allow the same to the District of Columbia, which has only a small number of miles of thickly traveled streets to offer in return. However, any member of Congress or temporary resident of the District of Columbia who has complied with the automobile laws of his own state may use the Maryland roads unmolested by displaying his home license. The taxpayers of Maryland have willingly contributed the $24,000,000, including the $5,000,000 spent upon Baltimore city streets and the Hanover street bridge, which has been necessary to complete its modern system of state and state aid roads, but with our maintenance cost, as well as our maintenance deficit increasing and with our tax rate increasing each year, it is doubtful, to my mind, whether they will allow the deficit to mount higher and higher, as it will do if we are not to receive the revenue derived from the District of Columbia."

State Will Not Maintain Volcanic Ash Roads.

Boise, Idaho.—The state highway commission has officially gone on record in favor of graveled roads through the lava ash solid formations of the Snake river valley. The action taken by the commission is expected to result in the graveling of the North and South highway, the Sawtooth Park highway, the Idaho & Pacific highway and the Yellowstone Park highway at points where the natural materials through which the roads are built will not sustain a heavy traffic. "The commission has acted in self defense," said William A. Broadhead of Mackay, its chairman. "We have been criticised for spending too much money in grading roads that go to pieces during the hot summer months and again in the winter. The cost of keeping the highways in shape is too great and far out of proportion to the original cost of constructing them." E. M. Booth, state highway engineer, in submitting to the commission figures on the cost of constructing and maintaining the roads under the supervision of the state, said that of $1,000,000 spent on the highways since the creation of the commission, $600,000 had been used in grading and that $100,000 had been expended in maintaining the dirt road built. The commission agreed that the several counties of southern Idaho through which the state highways pass will be given until July 1, 1918, in which to finance the cost of graveling roads kept up by the state. In the event that the highways are not surfaced, the state will not maintain them. Counties now engaged in building highways that are to be maintained by the state will be given a year after the completion of the roads in which to gravel them. The highway engineer announced at the meeting that the state is spending 20 per cent annually in keeping them in condition. Afterward he said that the money expended for maintenance purposes did not keep the roads in shape for travel more than four or five months out of the year. According to the highway engineer it is costing on an average of $1,500 a mile to surface the state highways. It costs about the same to establish and grade a road through the Snake river valley. The

commission expects to ask but few of the counties in northern and central Idaho to hard surface the state highways that cross them since it is claimed that the natural formation of the earth roads in both the Panhandle and the Salmon river country is strong enough to bear a heavy traffic. According to the highway commissioners and the highway engineer the roads maintained by the state through southern Idaho are in bad shape at this season of the year where they are not graveled. "The dust is so deep and the roads have cut so bad in the Twin Falls country that it is almost impossible for a farmer to haul a heavy load over them," Booth said. "The highway department spends money in grading up and putting a crown on the dirt highways early in the spring and when July and August pass the roads have been torn to pieces and nothing remains of them but a streak of dust. We rebuild them in the fall and when winter comes the highways are nothing more than streaks of mud across the plains. That makes them unfit for use more than half the year."

Road-Building in Japan.

Tokio, Japan.—Little attention has been given to the subject of road building in Japan up to the present time. The universal practice has been to haul ½ to 1 inch stone in handcarts to the spot needing repair, sprinkle a thin layer over the road, and let the traffic do the rest. Some of the bridges are not strong enough to support an ordinary touring car, and the roads, where they pass through towns and villages, are often so narrow that all available space is occupied by an automobile, making progress extremely difficult. The complaints of automobile owners and the results of a trial trip made by the commissary motor trucks of the Japanese army have evidently convinced the authorities that something should be done to better conditions, and it is reported that the Department of Internal Affairs intends to widen the roads, although nothing has been said about improving the surface.

SEWERAGE AND SANITATION

War Department Helps on City Sewer System.

San Antonio, Tex.—To insure the delivery of machinery required by the city for the construction of the Sherman street sewer pumping plant the order will be placed through or directly by the War Department. The construction of this plant is necessary for the operation of the sewer system at Camp Travis, where cantonments for the National Army are now in course of construction. The plant, which will cost approximately $30,000, is to be built and operated at the expense of the city, but on request of the government. When the city built the sewer pumping plant at the Concepcion Road, in the south part of the city, it was nearly a year after the order was placed before the pumps arrived. It is felt, however, that, backed by a government order, the necessary pumps can be obtained almost on demand. Work on the construction of the building will start at an early date, according to Commissioner Heuerman. Rapid progress is being made by the government in digging the trenches and laying the sewers. There are five big trenching machines at work, and some of the trenches are forty feet deep, to accommodate the gravity line to the proposed Sherman street pumping plant. The total length of the sewer necessary to afford facilities for the cantonments will not be less than fifteen miles. The expense of laying this sewer is to be borne by the government.

Housing Conditions in Milwaukee.

Milwaukee, Wis.—The health department has published a report on its investigation during the past year of housing conditions in the city. The report finds that about twelve per cent. of the city's population—or about fifty thousand people—are living under conditions which are generally recognized in the term "housing problem." The report emphasizes the striking fact that these poor housing districts, with only 12 per cent. of the city's population, furnished over one-fourth of all deaths from tuberculosis and 21 per cent. of the entire mortality under five years of age for the year 1915. Recommendations urged include increased power for investigation and regulation of the one and two family house, which at present cannot be adequately reached, and also a change in the present definition of lodgers or boarders dependent upon a specified minimum requirement of air space per person, and the licensing of such lodging houses. It urges more fundamental measures, including the improvement of property by the application of the single tax principle and also suggests consideration of municipal lodging houses. The housing problem is not confined to one district, thirteen out of the 25 wards in the city having poor housing. More than 623 acres, or 3.7 per cent. of the entire city area, are covered in the poor housing districts. It is pointed out that since at least one-half of this area lies in districts of high land value, the economic loss to the community through non-improvement of the property and the consequent inadequate taxation, is considerable. The report draws attention to the "remarkable coincidence of the reported cases of tuberculosis in the city at the present time to the districts that have a recognized housing problem." From the records of the Juvenile Court, it is found that fully 30 per cent. of the cases came from the poor housing districts. It is reported that 34 per cent. of all houses in these districts have features "intrinsically inimical to the life and health and good morals of the occupants. Fully 44 per cent. of the conditions found cannot be reached under the existing housing laws," says the report. It is pointed out that bad housing is probably a contributory cause in the case of tuberculosis, infant mortality, juvenile delinquency and other vicious social conditions. The various factors primarily responsible for bad housing in each case are summarized as follows: The occupant as chief cause, 23 per cent; the house as chief cause, 35 per cent.; insufficient housing laws, 44 per cent.; overcrowding, 50 per cent. The remedies proposed are education and legislation. For immediate correction stricter enforcement of the tenement house law; extension of the laws to include the two-family house and municipal lodging houses are urged. Dr. George C. Ruhland, commissioner of health.

Court Decides Against Sewer System.

Hammond, Ind.—The intercepting-sewer system planned for this city will not be built, the state supreme court having rendered a decision against it. The court objected to the method of special assessment. Contracts totaling about $800,000 were let in 1913, but no work has been done. The system was planned to discharge into the Calumet river and through this and the Sag channel into the Chicago drainage canal. It is reported that the plans will probably be renewed on some more acceptable basis.

To Reduce Housing Congestion.

Rochester, N. Y.—Better housing conditions in Rochester is expected to follow the passing of an ordinance by the Common Council, restricting the building of three and four-family houses on small lots. That Rochester is tending toward unnecessary congestion in the construction of its dwellings is the belief of the law committee of the common council, which recommended an ordinance that will eliminate such in the future. The ordinance defines what shall constitute a tenant house. Three and four-family houses must hereafter be constructed under the regulations governing tenement houses or must be placed on lots of not less than 60 feet wide and 100 feet deep. Another measure adopted further restricting the building of structures designed for human habitation, provides that a tenement house must front on a street and no building shall be constructed between the street and the tenement house. This ordinance also prohibits the building of any houses on lots occupied by buildings erected under the tenement house restrictions, unless the lot on which the tenement house is built reaches to another street.

City to Fight Mosquitoes.

Columbia, S. C.—At a joint meeting of city council and the city board of health an appropriation of $3,000 was made by the city to be used in a fight to eliminate malaria by destroying the breeding and "resting" places of the malaria conveying mosquitoes. The work will be carried on under the direction of the board of health, which will be augmented

by five additional health inspectors, who will be employed for two months. Direction was also given to the superintendent of the street department to do certain ditching deemed necessary by J. A. LaPrince, sanitary engineer, United States public health service, who has been making a sanitary survey of the city and surroundings. This work will also be done under the supervision of the health department. It is expected that an ordinance will be introduced making it unlawful for persons to maintain pools of water in any form, tanks or otherwise, unless they are screened. "There are numerous breeding places of malaria conveying mosquitoes both in the city and in the county close to the city limits, and about 30 miles of ditches and streams favorable to anopheles production," says the report that Mr. LaPrince submitted to the city council As the arrival of laborers from malarious districts is now greater than in previous years, it is essential that the proposed work for mosquito control be begun at once, otherwise there may be many cases of malaria contracted in Columbia and it will be an undesirable place for the United States troops to visit. The county and city should also arrange for the lowering of the water level in the channel of Gills creek, below Garner's Ferry road. It is essential that Hampton mill pond marsh be drained, but no outlet for drainage is yet available. At the present time thousands of anopheles larvae are present in the Gill creek valley near the cantonment. The military authorities can not drain their land until an outlet is provided. The present conditions there are a serious menace to health."

WATER SUPPLY

Progress on Hetch-Hetchy.

San Francisco, Cal.—More than $6,000,000 is involved in the construction of the tunnel aqueduct in the mountain division of the city's Hetch-Hetchy water project, plans and specifications for which have been transmitted to the board of public works by the city engineer. Bids for this unit of the project will be received by the board on August 22. For convenience, the aqueduct is divided into three sections; its aggregate length is a little over eighteen miles. The tunnel, of concrete, will be ten feet three inches high and of the same width. Work must commence in seventy days from the time the contract is awarded, and must be completed in approximately three years and four months. The estimated cost is $6,200,000, and a bond of $700,000 will be required of the contractor. This is one of the largest, though not the largest, units of the Hetch-Hetchy work. Another tunnel, thirty miles in length, is yet to be run through the Coast Range of mountains to bring the water to San Francisco.

County and Water Company Agree on Assessment.

Oakland, Cal.—The Spring Valley Water Company and the county of Alameda have arrived at an agreement concerning the company's future assessments here and the agreement has been ratified by the board of supervisors meeting as a board of equalization. By the new terms, the Spring Valley Water company will be hereafter assessed $1,500,000 on its riparian rights, as against $3,000,000 heretofore, the company agreeing to drop its six lawsuits against the county for previously alleged over-assessment. The company further agrees to pay the Alameda county water district $3,889.50 for a "tax inadvertently not made" at the last assessment. The new agreement is satisfactory to all parties concerned.

Metering Schools to Stop Waste.

Lawrence, Kan.—Free water to the city schools will be discontinued this fall, E. H. Dunmire, city engineer, has informed the board of education. Meters will be installed on services leading to all buildings in the near future and the regular monthly bill will be presented to the board of education. The rate to be charged is that fixed by city ordinance. E. B. Cronemeyer, clerk of the board, points out that charging the board for water used in the school buildings is causing additional burden on the taxpayers who are already paying for the maintenance of the water works and for the maintenance of the city schools. It is possible, Mr. Cronemeyer points out, that the school levy may have to be increased while the money is really going into another pocket—that of the water department of the city. In his letter to the board, Mr. Dunmire, head of the water department, says it is the desire of the water department as far as possible to have all those using water pay for it and thereby make the rates equal to all parties. Answering the representatives of the board when they objected vigorously to the plan, superintendent E. H. Dunmire said that the two important considerations were: 1. Preventing waste of water, which is a dead loss to the people. 2. Making every city department show financially just what it costs. "Free water and economy can't be found together," said Mr. Dunmire. "Besides, there isn't really any such thing as 'free' water. It costs something to pump and deliver every gallon. The school board may get water for nothing, but the city doesn't get it for nothing."

To Celebrate the Catskill Aqueduct.

New York, N. Y.—According to a preliminary report issued by the mayor's committee on Celebration of the Completion of the Catskill Aqueduct, the festivities will begin at the city hall on Columbus Day, October 12, and continue for two days. The committee, of which George McAneny is chairman, says that this piece of municipal work rivals in magnitude the construction of the subways. The original plan was to have the celebration early in June, but on account of the war the date was changed. A feature of the celebration will be an artificial waterfall from one of the East River bridges. A high pressure perforated water pipe will be laid clear across the river span, and the waterfall produced by this means. The water will be turned into this pipe on the evening of Columbus Day, and if necessary river traffic will be stopped. Former mayor McClellan, under whose administration ground was broken for the aqueduct, will be the guest of honor at the ceremonies in the city hall on October 12, when the new water system will be formally turned over to the city. At the conclusion of this ceremony a fountain in City Hall Plaza, made by Frederick MacMonnies, and presented by the late Angeline Crane, will be unveiled. In the evening a dinner will be held, at which mayor Mitchel will preside and bestow medals upon those who have done the great work. On the second day of the celebration there will be a civic parade, including members of the water supply commission, representatives of the contractors, workingmen and apparatus used in the construction of the aqueduct. The program also includes an allegorical pageant, to be given in the stadium of the City College.

STREET LIGHTING AND POWER

Gas Standard Reduction.

Trenton, N. J.—Increased costs in the production of gas during the past three years and the needs of the United States government for by-products of gas required for the manufacture of high explosives were two of the principal points urged before the board of public utility commissioners in the course of the argument upon the application of the Public Service and other gas companies for a reduction in the present standard of gas fixed by the board. The additional point was made that the proposed reduction in the heating standard of gas would not act injuriously upon the consumer, since the practical effect of the lower standard would be better service and greater efficiency in the use of gas, so that in effect the consumer would pay slightly more for a better service than is now possible. These arguments, advanced by L. D. H. Gilmour, counsel for the Public Service Gas company, were opposed by George L. Record and city counsel Spaulding Frazer of Newark, representing the municipalities opposing the lower standard. The concrete proposition of the gas companies was that the present minimum of 600 British thermal units required in gas be reduced to 550 units. Mr. Gilmour said that when the present standard was adopted it was practically unopposed by the gas companies because the relation between the cost of production and the price paid

by the consumer was a reasonable one. He stated that for the year 1913 the production cost for gas manufactured by the public service was 23.27 cents and burner cost was 54.19 cents. For the first five months of the current year he said, the production of cost in all divisions was 31.55 and the burner cost 62.31 cents, showing an increase in production cost under present conditions of 8.28 cents per thousand cubic feet, since the price of ninety cents was fixed.

"It will be readily seen," continued Mr. Gilmour, "that since 1913 conditions have materially changed throughout the United States and have affected gas companies everywhere. The relation between the cost of material and the price of the manufactured product is essentially different. The market price of gas oil has increased from three cents to something over six cents, making a difference, roughly, of twelve and a half cents a thousand feet in the cost of the manufactured gas in the holder. The price of gas coal has increased very materially and the difficulties with which the high grade gas coal are obtained makes it almost a necessity to use lower grades in the manufacture of gas."

The condition of the industry today is such that to conserve the resources of the country it is, or soon will become, necessary in the production of gas to use lower grades of coal than have heretofore been used for that purpose, and these lower grades of coal will not produce, without expensive enrichment gas of the calorific standard which the rules of this commission require."

Mr. Gilmour said the war has created an imperative demand for certain products which to a large extent have been allowed to remain in illuminating gas produced in this country, and has been consumed in the burning of the gas. These products, toluol and benzol, and the recovery of them, has become important in connection with the manufacture of high explosives. The recovery of toluol and benzol will diminish slightly the calorific value of the gas.

Reviewing the evidence submitted in behalf of the Public Service Gas company, Mr. Gilmour said they showed a gross income for the five months of 1917 of $4,901,468.94, as compared with $4,469,129.19 in 1916, and $4,036,579.71 for 1915, an increase for 1917 over 1915 of $864,889.23.

"These figures taken alone," continued Mr. Gilmour, "would indicate a healthful growth in business, but when we deduct from the income account the costs, as increased by higher-priced material and higher labor, we find the net result of operations for the first five months of the year in 1915 was $115,140.25; in 1916, $183,979.77, and in 1917 a loss of $70,429.27, showing a decrease in net earnings for five months in 1917 from 1916 of $254,409.04, and from 1915 a decrease of $185,569.52."

At the outset of his argument for the municipalities, Mr. Frazer challenged the companies to demonstrate that the proposed decrease in heating units would not materially affect the consumers. The companies' plea for a display of patriotism he described as throwing a little sand in the eyes of the consumer. He said they can get all the toluol needed and still maintain the present standard. This, he added, is now being done by the Public Service at its plants in Newark and Camden. He said that if the government's need for the by-products of gas was as urgent as claimed by the companies, the people would willingly make a sacrifice, but asserted that such is not the case. Mr. Record in opposing the move for a lower gas standard said: "As the case stands on the record, there has been nothing proved which would enable this commission to render any other decision than one dismissing the application.

"Under the laws, the commission can only change the standard from consideration of public interest. In this case there has been no proof whatsoever of any public interest that would be subserved by the change in the standard. It has, however, appeared both by the admissions of all of the witnesses of the gas companies, as well as by the testimony of the engineer employed by the commission and by the testimony of experts employed by the municipalities, that the changing of the standard applied for by the gas companies would make a substantial lowering of the lighting and heating powers of the gas supply, and that the cost of manufacturing the poorer quality of gas would be materially reduced by the company.

"From this proof it is apparent that, granting the company's application would compel the gas consumers of this state to use more gas of a poorer quality, and therefore would operate to increase the gas bills of every gas consumer of this state; while at the same time it would lessen the cost of manufacture to the company. The company would, therefore, obtain more money from the consumers for a very much inferior quality of gas. If such an application was granted, everything that was gained for the public by the Passaic gas case would be lost—and more, too.

"No proof was offered that there is not a sufficient quantity of these chemicals for all of the government and other uses already in the market. The testimony is undisputed to the effect that the market price of toluol has remained at its present price for about a year and a half, which is a plain indication that such demand as there is is now being supplied.

"In my judgment the commission has no power to grant a change of the standard without changing the price, and it cannot change the price unless it investigated all of the conditions under which the companies are now doing business, and determine what would be under the new conditions a fair return. If this task is undertaken, it is nothing more or less than a rate case and must be gone into most exhaustively by the company and by the municipalities and by the commission. There is no pretense on the part of anybody that there is in evidence in this case any proof upon which the commission could fix a just and reasonable rate."

Commission to Investigate Rate Increases.

Harrisburg, Pa.—The public service commission will shortly take up the new question created by gas, light and fuel companies of the eastern part of the state which recently began adding to their bills a seventy-five cent overhead charge or a "ready to serve" charge. Complaints have been filed by the boroughs of Morrisville, New Hope and Newtown against the Bucks County Public Service company, which furnishes gas, heat, power, light and fuel to the residents of some of the Bucks county towns.

Cities Oppose Electricity Surcharge.

Indianapolis, Ind.—The Indiana public service commission has held that there is doubt concerning the right of the Indiana Electric Light Association to petition on behalf of its members for a 30 per cent surcharge on all bills to their consumers and that each company desiring relief should file its individual petition independent of the association. At that time there will be a general inquiry into the abnormal conditions which the companies assert have brought about the necessity for a temporary increase in rates. It is presumed that the subject matter of the petitions will be identical, following in spirit the petition of the Indiana Electric Light Association, which urged that the increased price of coal and other materials made it necessary for the companies to have more revenue. The question of the jurisdiction of the commission in hearing the petition of the association, as a committee of companies, was raised by William A. Bond, city attorney of Richmond, appearing on behalf of all the cities affected, who contended that the commission could only take up the case of each company individually. In closing the argument, Mr. Bond called attention to the fact that no public owned electric utility had asked for an increase in rates. The attorney declared that the utility companies should not contend for "their pound of flesh and drops of blood" at this time, when everybody is having to make sacrifices on account of the war. C. N. Thompson, representing the Indianapolis Light and Heat Company, argued to the commission that it had the right under the statute to proceed with the hearing under the petition by the association because of emergency. A representative of the Northern Indiana Gas and Electric Company announced that its company would not ask the commission for rate increases in cities where the rates are definitely fixed by franchise.

Mr. Bond appeared on behalf of the many cities to be affected, having been chosen for this purpose by a committee of city officials appointed at a recent meeting of the Indiana Municipal League. The question of jurisdiction raised by Mr. Bond is one of wide importance, as the decision of the commission in regard to it will also have a direct bearing on petitions now before the commission for increases in rates charged by the gas companies and the railways doing business in the state. The Indiana Gas Association is now a petitioner before the commission on behalf of its members for permission to make a surcharge of 25 per cent and also to make a reduction in the heat standard of the gas produced. The railways doing business in the state are also joint petitioners for permission to charge a 15-cent increase on each ton of coal hauled. The indications are that the commission will proceed with the hearing of the general issues raised by the plea of abnormal conditions, with the understanding that the petitions shall be so altered that entries of the decisions of the commission may be made separately in regard to each individual petitioning company. A number of companies withdrew from the petition in order to thresh out the question with the cities out of formal hearings. Mr. Bond said the word "surcharge" was significant, as "it means something extraordinary, an extra load, an inequitable charge." "Why have some of these companies withdrawn?" he asked. "Perhaps it is because they are not entitled to any relief." William J. Wood, of the commission, asked Mr.

Bond whether he did not think the commission had the right to formulate rules and have a hearing on general conditions that were applicable to all the petitions concerning which the commission's decisions could be entered separately. Mr. Bond did not think this should be done. Mr. Wood indicated that in his opinion such a question as the "outrageous" prices charged for coal could be taken up, as it affects all of the petitions as coal consumers. Mr. Bond said he thought each petitioner should stand alone in the case in order that he might have the opportunity to make an appeal to the courts should he not be satisfied with the decision of the commission.

Richmond, Ind.—Earnings of the Richmond city light plant amounted to approximately twelve per cent on the investment during the fiscal year ended June 30, despite the fact that the cost of production has advanced ten per cent., according to a report by superintendent Kleinknecht. Both he and president Bavis, of the board of works, declared that the Indiana Electric Light Association, composed of light companies operating in forty cities in the state, which has petitioned the state public service commission for authority to raise their rates thirty per cent is taking advantage of present conditions. Richmond will not be affected by the ruling of the commission, but as all of the cities affected are members of the Municipal League of Indiana, Richmond city officials are pointing out the record of the municipally-owned plant here. The electric light association, in its petition filed before the service commission, claims that general operating expenses have advanced from 45 to 50 per cent due to high prices of materials used in the manufacture, and particularly coal. Superintendent Kleinknecht estimated that general operating expenses of the local plant have advanced ten per cent. After allowing $18,000 for depreciation and $10,000 for taxes, thus putting the plant on the same basis with a privately owned plant, the earnings would still be far in excess of the amount allowed privately-owned plants by the public service commission.

FIRE AND POLICE

Underwriters Report on Atlanta Conflagration.

Atlanta, Ga.—The city has apparently learned the lesson of the conflagration of May 21, according to a report on the fire by the National Board of Fire Underwriters in New York. The underwriters point out that in their report on the city made in 1909, the statement was made that "in the shingle-roofed frame residential section there is always a high conflagration hazard," and again in 1914, the conclusion was drawn that "the frame residential sections with shingle roofs possesses the hazard of flying brand fires to a pronounced degree." To better conditions in 1916 an ordinance was passed regulating roof coverings, but it was not to go into effect until July 1, 1917. Before this the conflagration came and justified the underwriters' warnings. The fire devastated a total area of about 300 acres and began by sparks carried from a shingle roof to others. The total number of buildings involved was 1,938, of which 47 were brick and 1,891 frame. Classified by occupancy there were 1,537 dwellings and apartments, 42 mercantiles, 351 garages and outhouses and 8 miscellaneous occupancies, including churches, schools, special hazards and warehouses. Of the total number of buildings, 1,682, or about 80 per cent., had shingle roofs. It is estimated that the total property loss was about $5,700,000, of which about $3,500,000 was covered by insurance. Extensive damage was done to the trolley wires, feeders and poles of the street railway system, amounting to approximately $125,000, and probably a like loss was suffered by the telephone company. The direct expense of the city was heavy; approximately $20,000 of hose was destroyed, and the cost of bringing outside aid will be considerable. About 10,000 persons were made homeless, and many, particularly negroes, lost everything they owned. The report describes the fire in detail from its outbreak until it was extinguished. All conditions are accurately recorded. A remarkable series of views is presented showing how the fire swept the city. Among the conclusions drawn by the underwriters the menace of the shingle roof is emphasized and it is pointed out that a shift of wind during the fire may have caused the high value business district to be involved. The fire chief and the department are commended on their good work. The report urges motorization of fire apparatus. The report says that the fire emphasized the need of a large supply of hose and suggests the purchase of 350 feet per company per year. The value of high pressure was demonstrated. Although necessary boiler and pump capacity has maintained, a reserve would have been desirable in case of accident. There is a need of adequate arrangements for the handling of telephone alarms. "Improved streets are of material value in a conflagration of this kind, as in many sections the unimproved ones made long detours necessary for the apparatus," says the report. Following the fire the council passed an ordinance controlling roof coverings. All buildings, except dwellings, frame buildings and buildings not exceeding two stories, or 30 feet in height—and 2,500 square feet in area, and not used for factories, warehouses or mercantile purposes must have roof coverings of standard quality, such as—(a) brick or concrete surface, (b) clay or portland cement tile, (c) tin or slate, (d) asbestos shingle ⅛ inch thick or thicker, (e) pitch or felt, built-up type, four or five plies, gravel or slag surface, (f) asbestos-asphalt, built-up type, four or five plies, smooth or grit surface, (g) other types of covering having equivalent fire-resisting properties, approved by the committee of consulting engineers. All the buildings excepted may be covered with the same types of roofing or with asphalt-rag-felt prepared roofing or asphalt-rag-felt shingles. The top and sides of dormer windows must be similarly covered. If a wood shingle roof is damaged by fire more than 20 per cent, the entire roof must be replaced with one of the specified materials. If a wood shingle roof is replaced for cause other than fire damage more than 10 per cent in any one year, it shall be entirely replaced with the proper materials. The building inspector is given the power to condemn and have removed any wood shingle roof that in his opinion is in such deteriorated condition as to be excessively inflammable. Within twelve years all wood shingle roofs must be replaced by proper coverings.

Half of Town Destroyed by Fire.

Harrison, Ida.—Thirty-seven residences and all except six business buildings in this town were in ruins as the result of a fire originating in a lumber mill. Half the town was wiped out and the damage was estimated about half a million dollars. A boatload and a carload of provisions were sent from neighboring towns, and a trainload of tents, provisions and bedding was sent from Spokane. Arrangements were made to accommodate those rendered homeless by the fire at the two hospitals, the hotel and the residences left standing, and in the tents. The fire was caused by a spark from an engine. There was no water to fight the fire and no fuel to run the water plant. The state gave the city $1,000 with which to restore order.

$100,000 Fire in Grain Elevator and Warehouses.

Rochester, N. Y.—Headed by chief Joseph M. Quigley, the police are investigating the fire which completely destroyed the Whitney elevator and warehouse and a number of warehouses. The damage amounted to over $700,000. Chief Little, who took personal charge of the work, stated that it was the hottest fire he had ever experienced. When the fire was at its height 11 engines were pumping water through more than 30 lines of hose. The flames soon worked through the roof of the elevators and spread to the cupola of a malt house. A strong north wind at the time caused the flames to sweep in the direction of small dwellings. A series of small explosions endangered the work of the firemen. After the fire had been raging for an hour and a half, the heavy sheet iron, which encased the exterior of the building, sprung loose, after being warped by the intense heat, and dropped to the street. Several firemen working close by the building at the time had a narrow escape from perhaps fatal injury. The iron fell onto one of the hose lines, cutting it in two and rendering it worthless. As the fire raged on, more pieces of

apparatus were summoned by chief Little. Soon a heavy metal chute, weighing three tons, and used to convey grain, fell with a crash. A short time after the water tower had been summoned, and was placed in position, Lase J. Akey, acting superintendent of the fire and police telegraph, discovered that it was within two inches of two high tension electric cables, carrying 42,000 volts. Had it at any time touched the wires anyone on the machine, or anyone touching it, would have been killed instantly. The cables were order cut. It left the entire district in darkness, except for the glare of the fire. Some of the firemen first to arrive took up a position on the roof of the west elevator. Beneath them the framework was afire. They kept up a steady stream of water into the east elevator until their attention was called to their danger by onlookers from the street. They had just taken to the extension ladders and reached a place of safety when the roof on which they had been working collapsed, taking with it several lines of hose. This followed the collapse of the east elevator.

MISCELLANEOUS

Conservancy Court Upheld.

Dayton, O.—The court of appeals has given an opinion holding as groundless various technical claims, and affirmed the Miami conservancy court in every particular in the error proceedings instituted against it. In the opinion of the court of appeals the decision of the judges of the conservancy court as to the question of the navigability of the Miami river, the right to sit at Memorial hall instead of at the courthouse, constitutional and jurisdictional questions and handling of the bill of exceptions were upheld in every part. Referring to the constitutionality of the conservancy law and the jurisdiction of the conservancy court, the court of appeals, in a written decision, states that these matters have been reviewed and decided by the supreme court of Ohio against the contentions of the plaintiff in error. The court further states it has examined the record with reference to each and every error assigned, and that it has found no error that would justify a reversal of judgment.

New York Zone Law in Courts.

New York, N. Y.—A decision bearing upon the effect of the building zone law on the purchase of real estate was made by supreme court justice Hotchkiss when he held that the law does not constitute an incumbrance on property such as to relieve purchasers from an agreement to take title. The question was raised in a suit of the Lincoln Trust Company to compel the Williams Building Corporation to take a parcel of land. The defendant had agreed to buy the property for $50,000 last August, after the building zone law had been passed but before the defendant had knowledge that the law would prevent the erection of a business building on the property. After paying $2,000 down the defendant refused to make further payment, on the ground that since the location is restricted to dwellings it is no use to the defendant. The defendant contended that the property was to be sold free of incumbrances, and that the building restriction is an incumbrance. Justice Hotchkiss said in his opinon: "Although the zoning law undoubtedly operates to restrict the unqualified use of the premises, it does not constitute an incumbrance within the meaning of the contract. It is rather in the nature of a governmenal regulation, subject to which all property is held and all contracts and conveyances made." The zone law has been in the courts in a number of minor cases. Interest is centered on the test case which will be taken up to the supreme court. One case reported draws a distinction between the building laws and the regulations. An attempt to appeal from the restrictions of the regulations was rejected because it was not an appeal from the action of the building department, which has exclusive jurisdiction, including the zone regulations. That is to say, the decision was upon procedure, not upon the merits of the appeal or the validity of the regulations. The action must be taken through the superintendent of buildings, and not over his head or in neglect of his authority. Another case dismissed a proceeding brought by a private party under the zone regulations, because he had no special grievance. The regulations are for public benefit, and must be enforced either by the city or by some one showing special injury. In other words, the regulations cannot be made the vehicle for private actions which might prejudice the regulations themselves. In all cases the city must have opportunity to support the regulations as an interested party. Otherwise the regulations might be attacked, perhaps invalidated, by litigations for that purpose, rather than for the protection of public interests. The law has the backing of the real estate associations and civic and commercial bodies and there appears no doubt that the measure meets with enlightened popular approval. An example of its acceptance by influential forces in the city is the publication of the Lawyers' Mortgage Company of a complete guide to the law and its history and applications. The volume is illustrated with splendidly prepared maps and sells at $1 a copy. Meanwhile the Board of Estimate and Apportionment has published a cloth edition of the final report of the Commission on Building Districts and Restrictions with appendices. It is being sold by the Committee on the City Plan at $1 per copy. The report contains 299 pages and 149 maps, charts, photographs and other illustrations. It includes an abstract of the testimony taken by the commission, the report of the committee of the whole of the Board of Estimate and Apportionment, a copy of the building zone resolution as adopted by the Board of Estimate and Apportionment and small scale maps of the districts established. The scope of the report and the great importance of this pioneer work are indicated in the following list of contents: Chapter I—Introduction; Chapter II—Necessity for Comprehensive Plan for City Building; Chapter III—Use Districts; Chapter IV—Appropriate Intensity of the Use of Land; Chapter V—Height Districts; Chapter VI—Area Districts; Chapter VII—Future Change and Development of Districting Plan. Appendices. I—Charter Provisions; II—Zoning Survey; III—Districting (Reprint from Heights of Building Report); IV—Record of Testimony and Statements in Relation to Necessity for Districting Plan; V—Some Results of Haphazard Development as Recorded by the Camera; VI—Report of the Committee on the Whole of the Board of Estimate and Apportionment, July 18, 1916; VII—Building Zone Resolutions adopted by the Board of Estimate and Apportionment July 25, 1916. VIII—Map Designations and Map Designation Rules Accompanying Building Zone Resolution adopted July 25, 1916; IX—Districting Resolution Annotations.

Race Segregation in Effect.

McAlester, Okla.—The race segregation ordinance recently passed by the city commission went into effect immediately upon its publication. Hereafter the negroes and whites are forbidden to move into neighborhoods where residents of the other color predominate. The ordinance says "It shall be unlawful for any white person to move into and reside in any colored block or for any colored person to move in and reside in a white block." The penalty provides for a fine of $25 to $100 for every offense, and each day or fraction thereof during which the offender continues to live in the forbidden territory is counted as a repetition of the act. "Colored blocks" and "white blocks" are defined as squares in which either race predominates at this time. The ordinance does not affect mixed neighborhoods as they stand now. Where negroes and whites live in the same district at present they may continue to do so. But if negroes attempt to move into a block where there are more whites than negroes the new ordinance will be invoked, and vice versa. Oklahoma City and Tulsa have passed such ordinances. This same kind of an ordinance is before the supreme court of the United States on a test case from Kentucky. The Louisville negro segregation ordinance was appealed to the supreme court from the court of appeals of Kentucky after all the courts in that state had declared it constitutional. The ordinance became effective May 11, 1914, and its purpose was to "prevent conflict and ill feeling between the white and colored races in the city of Louisville."

NEWS OF THE SOCIETIES

Calendar of Meetings.

July 30-Aug. 3.—SOUTHERN SOCIOLOGICAL CONGRESS. Annual meeting, Blue Ridge, N. C. Secretary, J. E. McCulloch, 508 McLachlen Bldg., Washington, D. C.

Aug. 1-3.—AMERICAN SOCIETY OF SANITARY ENGINEERING. Annual meeting, Grand Rapids, Mich. President, William C. Groeninger, Ohio State Board of Health, Columbus, O.

Aug. 6.—PACIFIC COAST ASSOCIATION OF FIRE CHIEFS. Twenty-fifth convention, Anaconda, Mont. Secretary, ex-Chief H. W. Bringhurst, Seattle, Wash.

Aug. 15-17.—LEAGUE OF WISCONSIN MUNICIPALITIES. Annual convention, Racine, Wis. Secretary, Ford H. MacGregor, Madison, Wis.

Aug. 21-23.—NEW YORK STATE FIREMEN'S CONVENTION, Flushing, N. Y. Secretary, Thos. Honohan, Frankfort, N. Y.

Aug. 22.—UNION OF NEW BRUNSWICK MUNICIPALITIES. Annual convention, St. John, N. B. Secretary, James King Kelley, St. John.

Aug. 27-29.—UNION OF CANADIAN MUNICIPALITIES. Annual convention, London, Ont. Secretary, W. D. Lighthall, K.C., Westmount, Que.

Aug. 29-31.—UNION OF NOVA SCOTIA MUNICIPALITIES. Annual convention, Truro, N. S. Secretary, Arthur Roberts, Bridgewater, N. S.

Aug. 29-31.—ONTARIO MUNICIPAL ASSOCIATION. Annual convention, Toronto, Ont. Secretary, B. H. Spence, 705 Lumsden building, Toronto, Ont.

Sept. 5-8.—LEAGUE OF AMERICAN MUNICIPALITIES. Annual convention, Gary, Ind. Secretary, Robert E. Lee, City Hall, Baltimore, Md.

Sept. 10-15.—NATIONAL EXPOSITION OF SAFETY AND SANITATION. Annual conference, New York, N. Y. Secretary, W. C. Cameron, Continental and Commercial Bank building, Chicago, Ill.

Sept. 11-13.—AMERICAN ASSOCIATION OF PARK SUPERINTENDENTS. Annual convention, St. Louis, Mo. Secretary, Roland W. Cotterill, 533 City Hall, Seattle, Wash.

Sept. 11-14.—NEW ENGLAND WATERWORKS ASSOCIATION. Annual convention, Hartford, Conn. Secretary, Willard Kent, 715 Tremont Temple, Boston, Mass.

Sept. 18-20.—LEAGUE OF VIRGINIA MUNICIPALITIES. Annual convention, Lynchburg, Va. Secretary, L. C. Brinson, Portsmouth, Va.

Sept. 24-29.—LEAGUE OF CALIFORNIA MUNICIPALITIES. Annual convention, Santa Rosa, Cal. Secretary, Wm. J. Locke, Pacific Building, San Francisco, Cal.

Sept. 25-27.—SMOKE PREVENTION ASSOCIATION. Annual convention, Columbus, O. Secretary, Frank A. Chambers, City Hall, Chicago, Ill.

Sept. 27-29.—AMERICAN AND CANADIAN ENGINEERS AND ARCHITECTS OF NORWEGIAN BIRTH OR DESCENT. Informal congress and re-union, Chicago Norske Klub, Chicago, Ill. Chairman, Committee on Arrangements, Joachim G. Glaver, consulting engineer, Chicago, Ill.

Oct. 15-17.—NATIONAL HOUSING ASSOCIATION. Annual conference, Hotel La Salle, Chicago, Ill. Secretary, Lawrence Veiller, 105 East 22d St., New York City.

Oct. 17-18.—LEAGUE OF MINNESOTA MUNICIPALITIES. Fifth annual convention. St. Cloud, Minn. Secretary-treasurer, Richard R. Price, University of Minnesota, Minneapolis.

Oct. 22-24.—AMERICAN CIVIC ASSOCIATION. Annual meeting, St. Louis, Mo. Secretary, Richard B. Watrous, 914 Union Trust building, Washington, D. C.

Nov. 19-24.—CITY MANAGERS' ASSOCIATION. Annual meeting, Detroit, Mich. Secretary, W. L. Miller, City Manager, St. Augustine, Fla.

Nov. 20-23.—PLAYGROUND AND RECREATION ASSOCIATION OF AMERICA. Recreation Congress, Milwaukee, Wis. Secretary, H. S. Braucher, 1 Madison Ave., New York, N. Y.

Nov. 21-24.—NATIONAL MUNICIPAL LEAGUE. Twenty-third annual meeting, Hotel Statler, Detroit, Mich. Secretary, Clinton Rogers Woodruff, 703 North American Bldg., Philadelphia, Pa.

League of Wisconsin Municipalities.

The nineteenth annual convention of the League of Wisconsin Municipalities will be held in Racine Aug. 15-17. Forty cities have joined the league since the meeting held in Oshkosh last year, and now all cities in the state with a population of 5,000 are members, according to the secretary.

More than 225 delegates, including 50 mayors, were present at the Oshkosh meeting last year, and this year between 300 and 400 are expected, as all but 15 of the 128 cities of the state will send representatives.

A large number of new problems which the war has brought before cities will be emphasized at this convention along with the usual subjects. Questions of registration for the army and the draft will be considered. Municipal employment bureaus to aid the state and county councils of defense, and city markets will be discussed.

Mayor C. B. Clarke, Neenah, is president of the league; Mayor H. W. Adams, Beloit, is vice-president; and Prof. Ford H. McGregor, head of the municipal reference bureau of the University of Wisconsin Extension division, is secretary-treasurer.

The board of trustees consists of Mayors Daniel Hoan, Milwaukee; John Mulva, Oshkosh; I. W. Thiessen, Racine; C. B. Clark, Neenah, and H. W. Adams, Beloit.

The district vice-presidents are: Mayors H. A. Runkel, Burlington; John Kaiser, Port Washington; George C. Sayle, Madison; Hans A. Koenig, Wauwatosa; A. A. Bently, La Crosse; H. E. Marquardt, Wausau; Elmer Hall, Green Bay; G. E. Dee, Chippewa Falls; Joe Konkel, Superior; Alderman Henry Smith, Milwaukee, and ex-Mayor Frank J. Wolff, Fond du Lac.

Utah Better Roads Association.

The Utah Better Roads Association was organized July 21 at Salt Lake City by delegates from the counties throughout the state.

The convention was opened at 10 o'clock by Herbert S. Auerbach, who was temporary chairman of the convention. He introduced Lester D. Freed, who told of the needs of the state in regard to highways, and said that with good roads throughout the state that the state would grow much quicker than waiting for railroads to be built. He asserted that the counties of the state should get together in the movement for good roads and that what was of benefit to one county would be of benefit to all. He was followed by Secretary of State Harden Bennion, who told the convention of the laws which were passed by the last legislature for the benefit of the roads, and who spoke briefly of the work which is being done by the state highway commission in securing good roads.

W. W. Armstrong was then selected as chairman of the convention, and in a short address pointed out the needs of the state. Mr. Armstrong, who was sponsor for the $2,000,000 bond issue for roads in the legislature, declared that with good roads all parts of the state would be placed in touch with the best markets. He urged the delegates to the convention to keep up the work for good roads the year around. R. T. Thurber and Charles Tyng were selected as the temporary secretaries of the organization to take care of the business of the convention.

A number of road machinery houses had exhibits at the convention and motion pictures of the making of good roads in the south and the Pike's Peak road were shown. C. A. Adams, president of the Pike's Peak Ocean-to-Ocean highway, was present at the convention.

The committees appointed to handle the affairs of the convention were as follows:

Organization—W. H. Wattis of Ogden, chairman; Le Roy Dixon of Provo, John Barnes of Kaysville, F. C. Scramm of Salt Lake, John P. Johnson of Spring City, M. T. Dobson of Kanab, J. W. Hendricks of Richmond, George A. Fisher of Heber, Earl Thompson of Vernal, E. H. Snow of St. George and Herbert S. Auerbach of Salt Lake.

Resolutions—Ralph Bristol of Ogden, chairman; Henry Welsh of Park City, Harold Allahman of Springville, T. W. Naylor of Salt Lake and R. M. Pope of Duchesne.

PERSONALS

Cobb, Lamar, has resigned as state engineer of Arizona. He will be succeeded by Thomas Maddock.

Cottrell, C. C., formerly connected with the California highway commission, is now assistant highway engineer of Nevada.

Ellis, W. H., has been appointed to succeed Edward G. Kane as commissioner of public works of Butte, Mont. Mr. Ellis was formerly assistant city engineer of Anaconda, Mont.

Guise, Philip, has been appointed county engineer of Sussex county and town engineer for Newton, N. J.

Henderson, C. E., has resigned his position as city engineer of St. Augustine, Fla., to assume that of county engineer of St. John's County. He will continue his location at St. Augustine, which is the county seat.

Hooker, Paul, has resigned his position of first assistant engineer on waterworks and sewage in the Pennsylvania state department of health.

(*Continued on page* 122)

NEW APPLIANCES

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations.

TRUCK WINCHES.

Mead-Morrison Equipment for a Variety of Purposes.

The Mead-Morrison line of truck winches are designed not only to make it possible to put a truck on which they are installed to many new uses, but also to materially lower the cost of work performed by the truck. Use of the winches enables the truck operator to use the truck during the usually idle periods of loading and unloading, thus cutting down the time and number of men necessary. The line includes three types of winches—the vertical capstan, the friction drum and the underslung double winch—each of which may be used for a number of purposes.

The vertical capstan winch is of such all-around use that it would prove a very valuable equipment for any truck with a platform body. It should find a particularly popular service on such work as loading and hoisting for contractors, electric light and power and water utilities, street and public works departments, park departments, etc. It can not only haul heavy machinery up to the truck body, but also haul the truck itself out of mud-holes and ditches. It is powerful and occupies a minimum of loading space. It is fitted with an automatic brake, which is designed so as to positively prevent backward turning of the winch head should the driving chain break. This is a particularly good feature in handling valuable machinery. The worm gearing runs in oil. The winch head is bronze bushed. The rope pull, single line, is 3,500 pounds; the rope speed, single line, is 60 feet per minute; the space required is 22 inches square; the weight is 350 pounds, complete; and the winch head is 8 inches in diameter by 11 inches long.

The friction drum, which is specially designed for automobile truck use, for work on which it is customary to use wire rope instead of the manilla or hemp rope used on capstans and winch heads. This type may be used to advantage in pulling light and power and other electric wires through conduits. It may also be used for public utility poles in which type of work it has been found particularly successful because of the latched foot lever operating the brake, since by its hold the load can safely be held suspended at any point. This friction drum winch can also be used, with excellent results, for such other purposes as pulling scraper buckets for back-filling trenches, hauling wire reels and machinery on the truck body and for pulling trailers, etc., to the truck. The worm gearing runs in oil and the friction surface is asbestos lined. The drum is independent of winch heads. The drum is bronze bushed and fitted with asbestos lined brake, operated by latched foot lever. The drum shaft bearings are so arranged that wearing of chassis when going over rough ground will not break the side frames or drum. The rope pull, single line, is 4,000 pounds and the rope speed, single line, is 60 feet per minute. The drum diameter is 10 inches and the winch head diameter, 6. The space required (front to back) is 27 inches and the outfit weighs 1,425 pounds complete.

The horizontal underslung double winch has in the past been used chiefly on army trucks, but is now receiving favor in commercial service. The underslung is designed to give a greater rope pull than the vertical capstan. It has the further advantage that all the loading space is left clear, as the winch is below the body. It may be used for hauling other trucks out of holes and ditches and for pulling heavy machinery and materials on to the truck body. Contractors have found it of great use in changing the position of hoisting engines and concrete mixers and for hauling loaded trailers from excavated ground on the truck itself. The winch is well adapted for installation on dump body trucks and on "road making trucks." It is also equipped with the valuable automatic brake feature. The rope pull, single line, is 6,000 pounds and the rope speed is 120 feet per minute. The winch heads are 8 inches in diameter and the weight, complete, is 1,000 pounds.

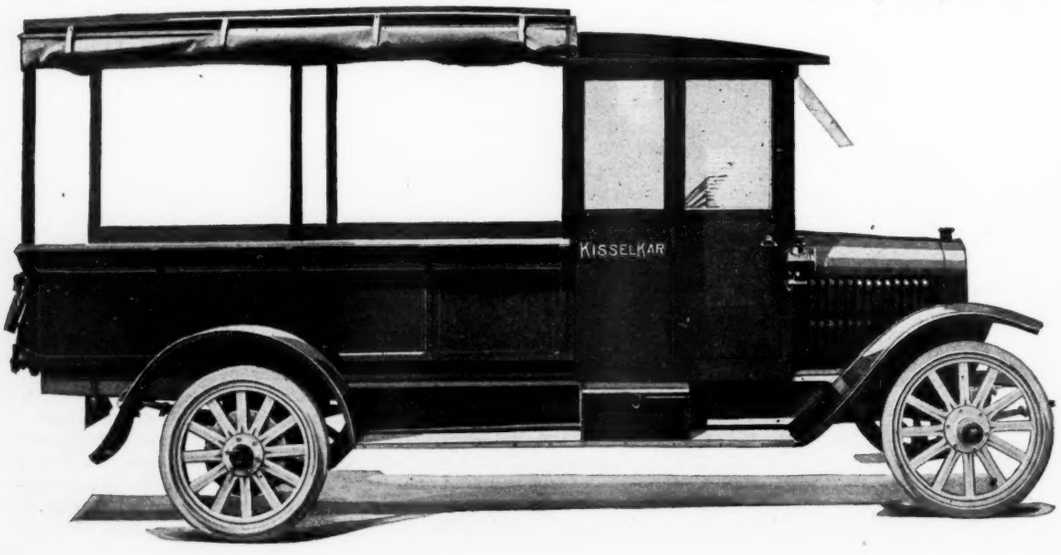
Cuts on pages 119, 120 and 121 show the different types of winches and the equipment in action. The winches are made by the Mead-Morrison Mfg. Co., East Boston, Mass.

ALL-YEAR CAB.

New Feature for Kissel Trucks.

An innovation which promises to have a marked effect on the efficiency and comfort of motor truck drivers and one that will give increased results to truck owners is that of the All Year Cab, originated, designed and built by the Kissel Motor Car Company, Hartford, Wis. It is a new adaptation of Kissel's original convertible idea, giving to truck drivers a closed, warm cab in winter, and which can be easily and quickly changed into the Kissel standard open cab in summer.

Standing a little over five feet from chassis frame to roof, the cab frame is of extra hard wood, bolted and locked. All sides and doors are covered with specially treated sheet metal enabling



KISSEL TRUCK WITH ALL-YEAR CAB—WINTER POSITION.

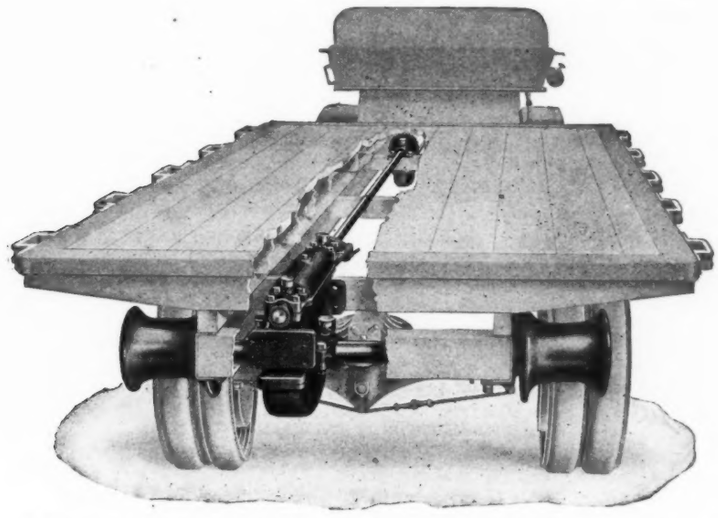
the cab to withstand the twists of the frame when negotiating rough roads. Instead of the common wooden dash that loosens quickly, the All Year cab dash is of heavy plated metal giving unusual substantiality.

The seating capacity is for three men, with plenty of leg room. Tank and tool compartments are under the seat. Doors on each side measure 25 inches wide—an unusual width for truck cabs. Metal pockets are furnished on both sides of cab for time, tire, gasoline and other mileage record cards and books. Another feature is that of the instrument board set at right angles, with plenty of space for all necessary electrical instruments, speedometer, gauges, etc. Special Pittsburg glass is furnished for the doors, sides and rear window, which has a heavy wire protection screen. A rain-vision windshield is also included with the winter equipment.

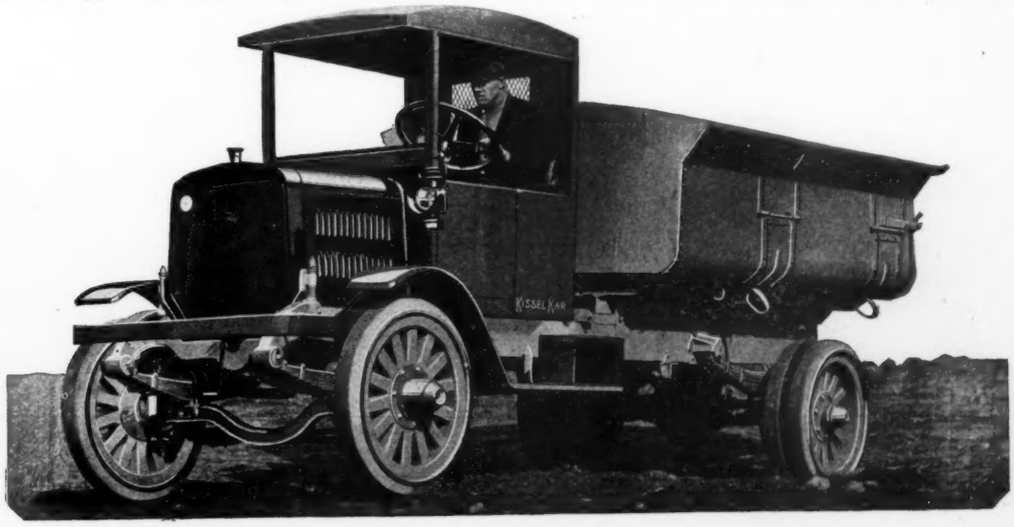
The All Year cab is built to be wind-proof, rain-proof, cold-proof—in fact, all-weather proof, not only giving the driver in winter a warm, dry, comfortable housing under all climatic conditions, but a cab that is solid and substantial, roomy, sightly and attractive. To change the All Year cab into the Kissel standard open summer cab, the winter inclosures, consisting of windshield, side, door and rear windows, are easily and quickly removed.

The All Year cab, which the Kissel Motor Car Company has been experimenting with all winter, covers other original and exclusive features designed to insure all parts fitting closely, securely and permanently in the most severe weather.

With this truck drivers and helpers will not have to work unprotected in winter weather nor truck owners jeopardize their property in the hands of frozen drivers. The All Year cab, which is exclusive with the new Kissel trucks, is in its open form, without the winter inclosures, standard equipment on all the new Kissel truck models excepting "The Flyer" light delivery car. The cab, summer and winter form, is shown in the accompanying illustrations.



MEAD-MORRISON HORIZONTAL DOUBLE UNDERSLUNG WINCH—SHOWING POWER TRANSMISSION.



KISSEL TRUCK WITH ALL-YEAR CAB—SUMMER POSITION.

COMBINATION ROAD MACHINE.

Spaulding Excavator, Self-Loading and Self-Dumping Wagon.

The Spaulding road machine is designed to give a variety of services in contractors' work of many types. It may be used for road making, excavating, leveling, filling, shallow drainage ditching, straightened water courses, irrigation ditching and many other kinds of work.

The loading device on this self-loading machine is a part of the body, being attached to the front end of the body, and the body being pivoted on the rear axle a little back of its center. The cutter or blade is attached to the main frame of the body, is convexed and polished like a plow shear and extends back to the steel guard, which extends a little over the lower front end of the endless elevator apron, which elevates the dirt into the front end of the body. In the bottom of the body is the main endless apron, which carries the material to the rear as fast as the front end is filled. This end of the body, to which the blade is attached, is raised and lowered by a worm gear, which is under the control of the operator, and can be held to any depth desired. Both the elevator apron and the main apron are under the operator's control, and either may be run independent of the other.

In order to load the machine, it is simply necessary to throw the elevator in gear and lower the front of the body until the cutting edge is at the desired depth. As the front end of the body is filled the main apron is thrown into gear as desired, until the load is completed. The front is then raised and the load is ready to be delivered. The load may be dumped in one place by a foot lever, or spread while the machine is advancing 45 feet, by throwing the main apron into gear. The machine need not be stopped for any operation excepting when dumping in one place by means of the foot lever.

The machine is easily handled by four good horses or a light twelve

horse-power tractor. Roller bearings and hard oilers throughout make the equipment light running. One man, it is claimed, can easily handle the team and control the machine without any assistance. The machine will work on sod or hard road without the need of plowing. It is built to load 1½ to 2 cubic yards of dirt in 20 seconds and to unload it in an equal time, either scattering it evenly over forty feet of roadway or dumping it in one pile in a low spot or hole. In building grades the road is kept smooth and free from dumped dirt. It has been timed to load 15 loads while nine men with shovels loaded one. In excavation work records indicate that work can be done at about one-fourth the cost of doing it with teams.

The illustration on page 122 shows the outfit, drawn by a tractor, at work. It is made by the Spaulding Manufacturing Co., Grinnell, Ia.

TRACTOR-TRAILER DUMP TRUCK.

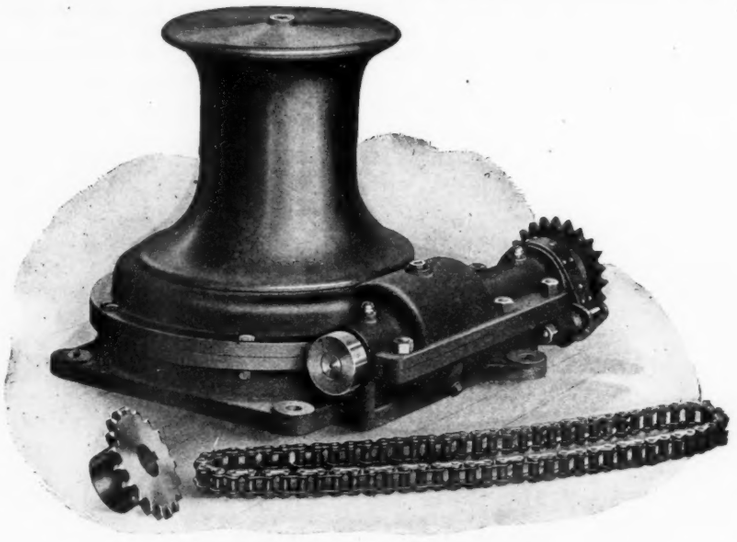
Harvey Machine With Hydraulic Hoist.

The handling and hauling of materials even with the economy and efficiency of motor equipment still presents a number of problems which, if they could be properly solved, would still further reduce costs and conserve time. The burden of idle time while loading at team tracks can be cut down by the use of trailers. This improvement was for a time at a disadvantage, however, when it came to dumping.

This latter important difficulty is now claimed to have been overcome in the design of the Harvey tractor-trailer dump truck. A six-ton outfit, for instance, recently sold to the Standard Material Company, one of the largest construction material firms in Chicago, consists of a tractor and two trailers, each trailer having a capacity of six tons. Each of the trailers has a hydraulic hoist, the pump and oil tank being mounted on the tractor, and connection being made to the hoist on the trailer by means of a flexible hose with a quick attachment, so that little time is lost in changing from one trailer to another. Each trailer has two heavy duty jacks, which quickly raise the trailer from the fifth wheel attachment on the tractor and supports it while being loaded.

The fifth wheel construction on the tractor, together with the short wheel base on the tractor, gives the outfit a very short turning radius, making it valuable for use at team tracks and in other places where loading or unloading could be practically impossible with the average truck.

The Standard Company's outfit, which is shown in one of the illustrations on page 121, has been severely tested by gruelling service, and the economy of the outfit, it is reported, has been already strikingly indicated. The other illustration shows the hydraulic hoist arrangement and connections for operating the dump mechanism. The equipment described is made by the Harvey Motor Truck Works, Harvey, Ill.



MEAD-MORRISON CAPSTAN WINCH.

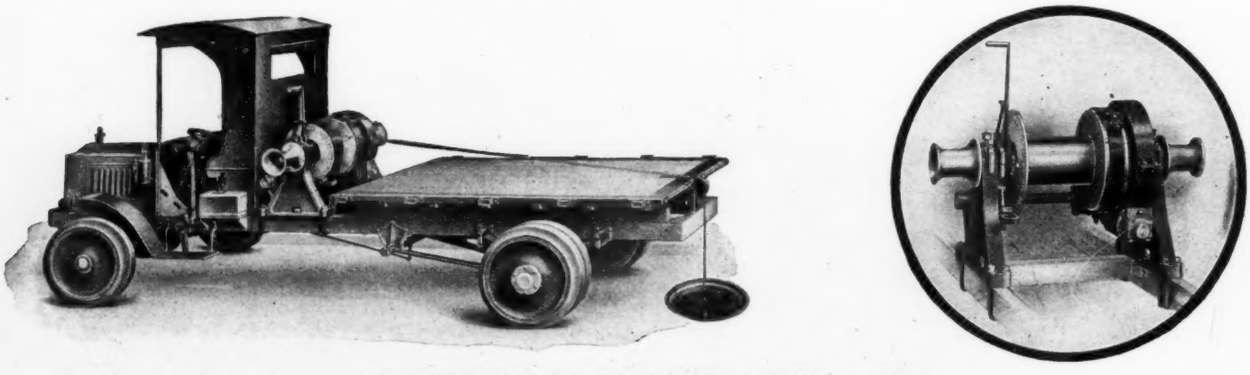
INDUSTRIAL NEWS

Cast Iron Pipe.—Prices continue at the record high levels of the last few weeks. While private buying continues to some extent, municipal business is far below actual needs. Quotations: Chicago—4-inch, class B and heavier, $68.50; 6-inch, $65.50. New York—4-inch, class B and heavier, $68.50; 6-inch, $65.50. Birmingham—4-inch, class B and heavier, $63; 6-inch, $60; class A, $1 extra.

The Odorless Sewer Basin Company, Youngstown, O., announces the appointment of Frank H. Dimon, Milan, O., formerly state fire marshal, as special representative to call on city engineers and officials on behalf of the company's odorless cast iron sanitary sewer basin.

Bulk Cement.

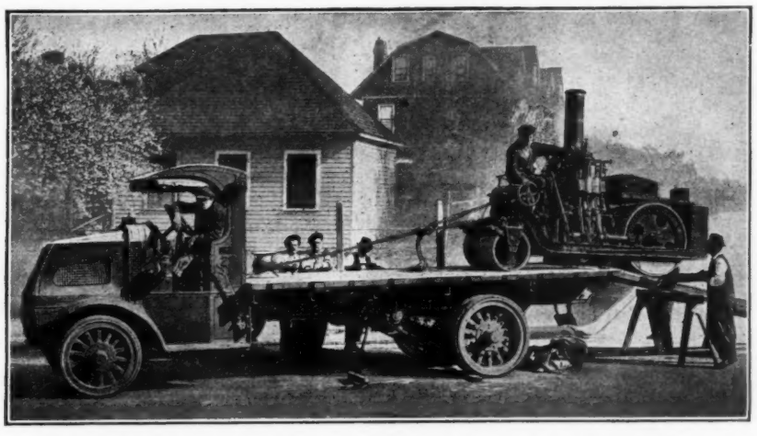
The Portland Cement Association, 111 West Washington street, Chicago, Ill., has issued a pamphlet on the "common sense and economy" of using bulk cement. The main reasons given for handling cement in this way are the savings due to the following: No sack loss. Less labor from car to mixer. No labor to count, bundle and return cloth sacks. No bookkeeping on sacks. No valuable storage space used for them and no fire insurance to pay for them. No hauling charges or freight to pay on sacks returned and no interest to pay on money tied up in sacks. The classes of work in which bulk handling is held to be particu-



MEAD-MORRISON FRICTION DRUM WINCH AT WORK.

larly advantageous and the methods employed are explained with practical and helpful detail. Unloading, handling and measuring are described. A partial list of bulk cement users is given.

The booklet says: "As a container for portland cement the wooden barrel is almost a thing of the past. The cloth sack and paper bag are similarly out of place on many construction jobs and in plants where concrete products are manufactured. The shipment of cement in bulk is neither new nor revolutionary. It is the simplest and least expensive method of getting cement from the manufacturer's bin to the job. Bulk cement was first used about thirty years ago, but shipment in this form was not extensive until 1912. Then several contractors saw the possibilities of making a saving by handling their cement in the same manner as sand, pebbles and crushed stone. Their success has led to a marked increase in the shipment of cement in bulk. There is every probability that in the near future the use of cement in sacks on large construction jobs, in cement products plants and even on many small pieces of concrete work, will be exceptional."



MEAD-MORRISON CAPSTAN WINCH HAULING UP ROLLER.

Truck Bodies for Army Service.—Contracts for 24,050 motor truck bodies have been let by the War Department. The International Harvester Co. of Chicago will build more than one-third, its contract being for 10,000. The next largest contract is with the Grand Rapids School Equipment Co. of Michigan for 6,400. The other awards follow: London Auto Supply Co. of Chicago, 1,900; Mulholland & Co., Dunkirk, N. Y., 500; Hercules Buggy Co., Evansville, Ind., 400; Theodor Kundtz Co., Cleveland, 550; G. W. Stratton Co., Defiance, Ohio, 1,000; Eagle Wagon Works, Albany, N. Y., 1,200, and Continental Car Co., Louisville, Ky., 2,000.

The George Cutter Company, South Bend, Ind., announces the addition to its sales organization of J. H. Lynch, who will operate from the compay's branch office in New York City. For fifteen years Mr. Lynch has been associated with the electrical industry as a central station man, contractor and salesman. During the last five years he has been connected with the Buffalo office of the Westinghouse Electric & Manufacturing Company and has made many friends in the electrical trade in the eastern territory.

Thomas T. Fauntleroy has been appointed receiver by the circuit court for the **Sanitary Street Flushing Machine Company,** and was instructed to file suit against the Studebaker Corporation of Detroit to recover the assets of the company. These assets, which include patents, are estimated to be worth $500,000. The assets were sold about a year ago under a mortgage held by M. J. Hurley, of the Efficiency Contracting Company, which was organized by Hurley and later, it was alleged, sold to the Studebaker Corporation in a deal promoted by Hurley and Charles Sutter, president of the Sanitary company.

The Asbestos Protected Metal Company, Pittsburgh, Pa., announces the temporary closing of its Cincinnati office on August 1, 1917, due to the fact that Mr. E. G. Irwin, Cincinnati manager, has entered the Ohio National Guard. Communications addressed to the home office, First National Bank building, Pittsburgh, will receive immediate attention.

The Goodyear Tire & Rubber Co., Akron, Ohio, is announcing the following changes in branch managers: B. S. Waterman, formerly branch manager at Boston, Mass., has been placed in charge of the solicitation of manufacturers' business in all departments, for the New England district. C. B. Peschmann, who has been in charge of

HARVEY TRACTOR-TRAILER DUMPING.

HARVEY HYDRAULIC HOIST.

the Goodyear sales school at Akron, becomes manager of the Boston branch. K. H. Dresser, formerly manager of the Springfield, Mass., branch, has been transferred to Akron, and succeeded by R. E. Lane. Edward Lingenfelder, for a number of years manager of the Los Angeles branch, and one of the most widely known tire men on the Pacific coast, has resigned to go into business for himself as a tire dealer. George Bellis has advanced from the position of manager at Sacramento, to manage at Los Angeles, succeeding Lingenfelder. C. B. Reynolds, formerly manager, Tacoma, Wash., is now manager at Sacramento. A. E. Patterson, former salesman in the Portland, Oregon, branch, is now manager at Tacoma, Wash.

PERSONALS

(*Continued from page* 117.)

Jewell, Albert H., is now sanitary inspector on the Michigan state board of health. He has been assistant engineer in the state board of health of Kansas.

Jones, A. W., formerly assistant director of the Portland, Ore., public employment bureau, becomes head of that bureau, succeeding N. F. Johnson, who becomes chief of police.

Kenan, R. L., formerly county engineer of Chilton Co., Ala., has formed a partnership with Fulton Pace, to be called Kenan & Pace, consulting and highway engineers.

Krug, Frank S., has been appointed chief engineer of the Cincinnati Rapid Transit Commission. He will continue in his duties as city engineer.

McNally, Edward, has been appointed chief of the Richmond, Ind., police department.

Mayor Puchta of Cincinnati has appointed the following as members of the City Flood Prevention Commission: Albert Bettinger, chairman; Gabe Weil, E. C. Gibbs, A. J. Conroy and city engineer Krug.

Montgomery, Julian, has been appointed chief office engineer of the state highway department. He was previously city sanitary engineer of Austin, Tex.

Poole, Cecil, consulting engineer, Atlanta, Ga., and mechanical engineer for the city, has been appointed a member and the secretary of the Board of Consulting Engineers of Atlanta, which was recently created. Mr. Poole has been editor of technical magazines. For a number of years before going to Atlanta, Mr. Poole had made a special study of electrical machine design and construction and of gas power engineering. He is widely known as a writer on technical subjects and is a fellow of the American Institute of Electrical Engineers and a member of the American Society of Mechanical Engineers.

PROBLEMS CITIES ARE STUDYING WITH EXPERTS

The WATERWORKS of Jasper, Minn., will be improved according to plans and specifications prepared by J. A. Rowatt, Willnar, Minn.

Extensions to its SEWAGE DISPOSAL PLANT are contemplated by Haddonfield, N. J. The engineers for the improvement are Remington & Vosbury, 6th and Market streets, Camden, N. J.

STREET IMPROVEMENTS are to be made by Georgetown, Ont. The consulting engineer for the work is Herbert Johnston, 130 Lancaster street, E., Kitchener, Ont.

Montgomery County, Norristown, Pa., is to reconstruct a ROAD at a cost of $100,000. The engineer for the improvement is Chas. Mebus, 110 South Broad street, Philadelphia, Pa.

A large concrete RESERVOIR is to be constructed by Cumberland, Md. The consulting engineer for the proposed improvement is James H. Fuertes, 140 Nassau street, New York, N. Y.

Utica, N. Y., is considering the purchase of the WATER WORKS of the Consolidated Water Co. of the city. The city has retained to investigate and APPRAISE the property, Hill & Ferguson, engineers, 100 William street, New York, N. Y., and Charles H. Poole, expert appraiser, Utica, N. Y.

The New Jersey Bridge and Tunnel Commission is progressing in its proposal to construct an $8,000,000 suspension BRIDGE between Camden and Philadelphia. The consulting engineers to prepare plans and specifications for this important project are Waddell & Co., 165 Broadway, New York, N. Y., and 800 Graphic Arts building, Kansas City, Mo.

Palo, Kans., is to construct an ELECTRIC LIGHT PLANT and WATERWORKS. The engineer is G. P. Taylor, Stockton, Kans.

SEWERS and PAVEMENTS are improvements proposed for Torranceton, Pa. The engineers to prepare plans and specifications are Paxson & Morgan, Second National Bank building, Wilkes-Barre, Pa.

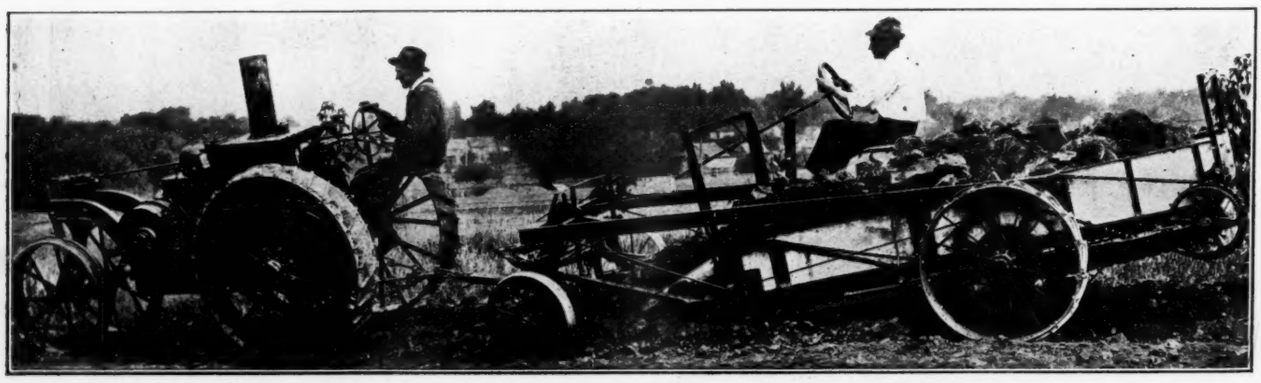
SEWERS are to be constructed by Dardanelle, Ark. The district commissioners have the engineering services of Ford & MacCrea, 325 Gazette building, Little Rock, Ark.

Red Fork, Okla., is to improve its WATERWORKS. Plans for the work are in preparation by the engineer, W. E. Davis, 344 Bank of Commerce building, Tulsa, Okla.

WATERWORKS extensions to cost $125,000 are proposed by Poteau, Okla. The city has the expert services of the Benham Engineering Co., 1300 Colcord building, Oklahoma City, Okla.

Duval County, Jacksonville, Fla., is to build a BRIDGE to cost $1,000,000, bonds for which have been voted. Harrington, Howard & Ash., Orear-Leslie building, Kansas City, Mo., are to prepare plans and specifications.

To avoid GRADE CROSSINGS the Allentown, Pa., city planning commission has retained Frank Koester, consulting engineer and city planning expert, Hudson Terminal building, New York, N. Y., to prepare street plans for the site of an eight mile railroad to be built by the Lehigh and New England Railroad Co. of Bethlehem and to be used exclusively for industrial developments. Mr. Koester prepared a comprehensive city planning report for the city a year ago.



SPAULDING EXCAVATOR, SELF-LOADING AND SELF-DUMPING WAGON.